VOL. XXIV NEW YORK—THURSDAY, FEBRUARY 2, 1911—CHICAGO. No. 5

THE AUTOMOBILE

CHICAGO, Jan. 30—Displaying all that is progressive in American motordom, the Tenth Annual National Automobile Show, under the auspices of the National Association of Automobile Manufacturers, opened its doors Saturday night and invited the public to an intimate inspection of the perfection of the automobile as represented in 1911 manufacture.

And the public eagerly took advantage of the offer, for when the reports were received from the box offices after the close of the first session, it was found that all records for opening night in Chicago had been broken far and away. All through the evening it had been apparent to veteran exhibitors that there was a big crowd present, but the figures showed that fully 50 per cent. more visitors had been entertained on Saturday night than on the corresponding night last year.

As opening night last year also established a record, the significance of the outpouring for a first glimpse of the cars is palpably apparent.

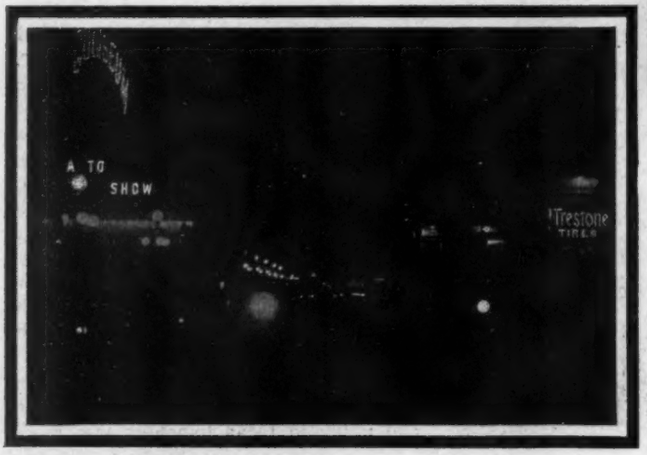
Nearly 400 gasoline passenger automobiles and chassis were installed in the various exhibition halls, exceeding by a material margin the number shown at any display of motordom either here or abroad. In some ways the Chicago Show is in a class all by itself. It presents to its patrons practically everything that has been shown in Madison Square Garden in quite as much detail and elaborateness, and in addition its aisles and halls and arenas are arranged with automobiles that were not shown in New York. In connection with the gasoline car exhibits, the electrics make a gallant showing with forty types exhibited.

There are no crude high-wheelers among the lot, such as characterized former Chicago shows. They are built for service and are beautiful in their graceful lines and luxurious finish. The Edison battery is much in evidence.

The decorations this year constitute an artistic triumph. Not that they are particularly ornate or elaborate, but from the fact that they harmonize so thoroughly with the buildings and the automobiles on exhibition. In the Coliseum annex and basement the scheme is rather plain, but the colors are so skilfully blended and contrasted that the effect is like the chased setting of a necklace composed of perfect mechanical gems. For figurative purposes the necklace may be said to adorn the person of the great, bustling, busy city in which the show is being held.

Chicago is the incarnation of trade, of business and of commerce, and the automobile as one of the chief factors in increasing the personal efficiency of the business man, either by solving the problem of actual, personal transportation, or in the line of giving him rest, recreation and rejuvenation so that he is able to accomplish real results in business, partakes sympathetically of the very atmosphere of the city. Thus, while the stage setting at the Coliseum might be designated as severe, it is in reality businesslike and serves to emphasize the appearance of grace, beauty and utility in the automobiles that repre-

BIRD'S-EYE VIEW OF THE INTERIOR OF THE SHOW OF THE N. A. A. M.



EXTERIOR OF THE COLISEUM AT NIGHT

sents in an effective way the truest type of the decorative art.

In the great, frowning armory of the First Regiment Infantry, Illinois National Guard, the drill-hall has been converted into a pine forest in which the greenery brings out by contrast the sheen of polished brass and glistening lines of the skeleton-like chassis, which are shown in many of the exhibits. The forestry plan that has been worked out in the home of Chicago's Dandy First has struck a responsive note in the minds of the trade and the public, the general effect being decidedly harmonious.

In past years there has always been more or less of a clashing of interests between the high-priced Eastern cars and the

HUGE COLISEUM, WHERE THE TENTH ANNUAL IS NOW IN PROGRESS

INTERIOR OF THE COLISEUM AT NIGHT

low-priced automobiles of Western manufacture. The superior finish of the Eastern product has always been a point of pride with the makers of that section, and the Western cars, turned out with the idea of quantity production, at least as strong as the desire for quality, have had to fight to gain as prominent a place in the eye of the public as has been enjoyed by their competitors.

This year, that situation has been corrected. Not only is there a vastly better feeling among the trade, notwithstanding the intense business rivalry, but the experience of the early years has resulted in many refinements of finish on the part of the Western contingent that makes any differences that may exist between the product of the manufacturers of

BIRD'S-EYE VIEW OF THE INTERIOR OF THE SHOW OF THE N. A. A. M.

EXTERIOR OF THE COLISEUM AT NIGHT

scnts in an effective way the truest type of the decorative art.

In the great, frowning armory of the First Regiment Infantry, Illinois National Guard, the drill-hall has been converted into a pine forest in which the greenery brings out by contrast the sheen of polished brass and glistening lines of the skeleton-like chassis, which are shown in many of the exhibits. The forestry plan that has been worked out in the home of Chicago's Dandy First has struck a responsive note in the minds of the trade and the public, the general effect being decidedly harmonious.

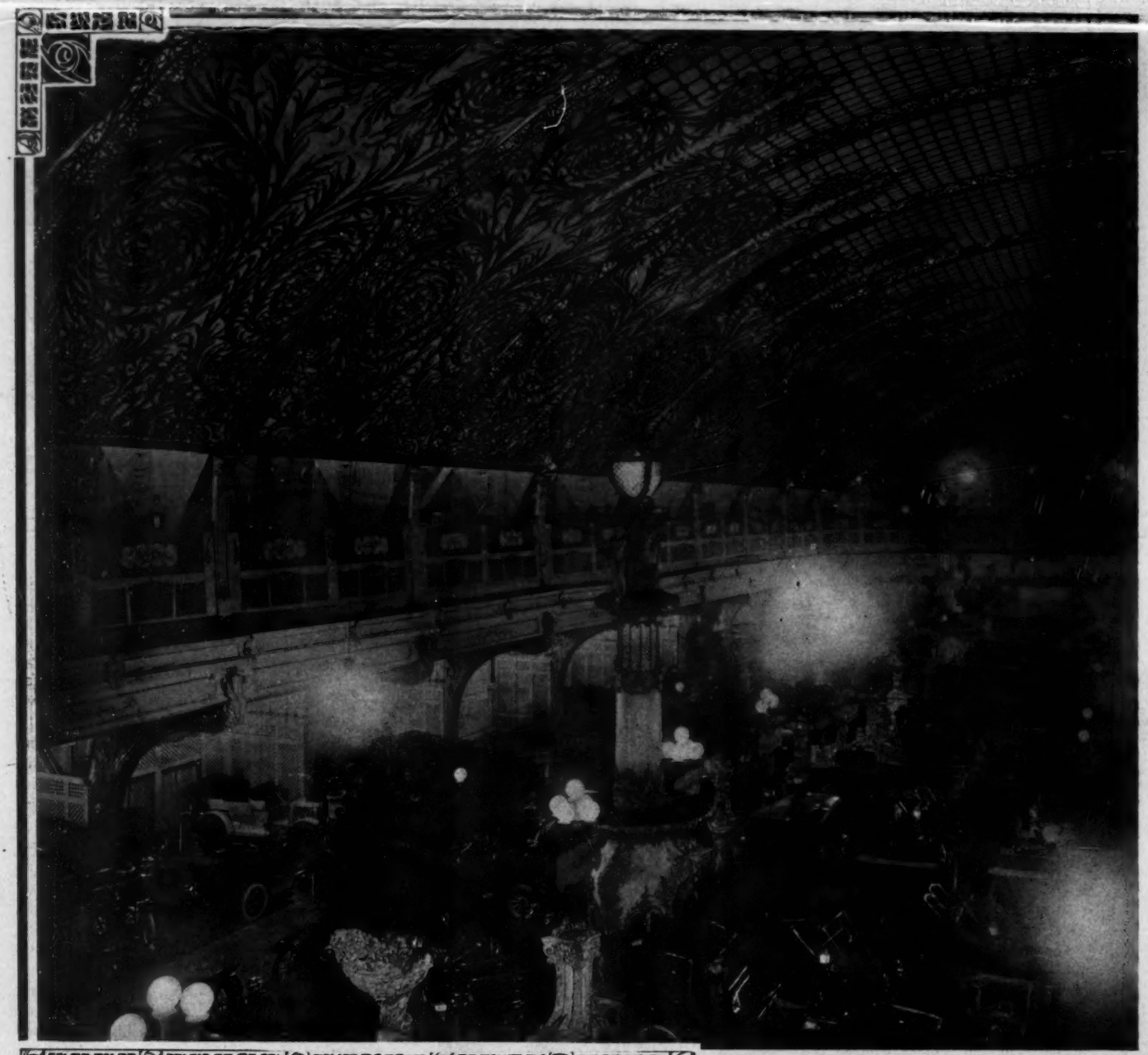
In past years there has always been more or less of a clashing of interests between the high-priced Eastern cars and the

HUGE COLISEUM, WHERE THE TENTH ANNUAL IS NOW IN PROGRESS

INTERIOR OF THE COLISEUM AT NIGHT

low-priced automobiles of Western manufacture. The superior finish of the Eastern product has always been a point of pride with the makers of that section, and the Western cars, turned out with the idea of quantity production, at least as strong as the desire for quality, have had to fight to gain as prominent a place in the eye of the public as has been enjoyed by their competitors.

This year, that situation has been corrected. Not only is there a vastly better feeling among the trade, notwithstanding the intense business rivalry, but the experience of the early years has resulted in many refinements of finish on the part of the Western contingent that makes any differences that may exist between the product of the manufacturers of



BIRD'S-EYE VIEW OF THE INTERIOR OF THE SHOW OF THE N. A. A. M.

EXTERIOR OF THE COLISEUM AT NIGHT

sents in an effective way the truest type of the decorative art.

In the great, frowning armory of the First Regiment Infantry, Illinois National Guard, the drill-hall has been converted into a pine forest in which the greenery brings out by contrast the sheen of polished brass and glistening lines of the skeleton-like chassis, which are shown in many of the exhibits. The forestry plan that has been worked out in the home of Chicago's Dandy First has struck a responsive note in the minds of the trade and the public, the general effect being decidedly harmonious.

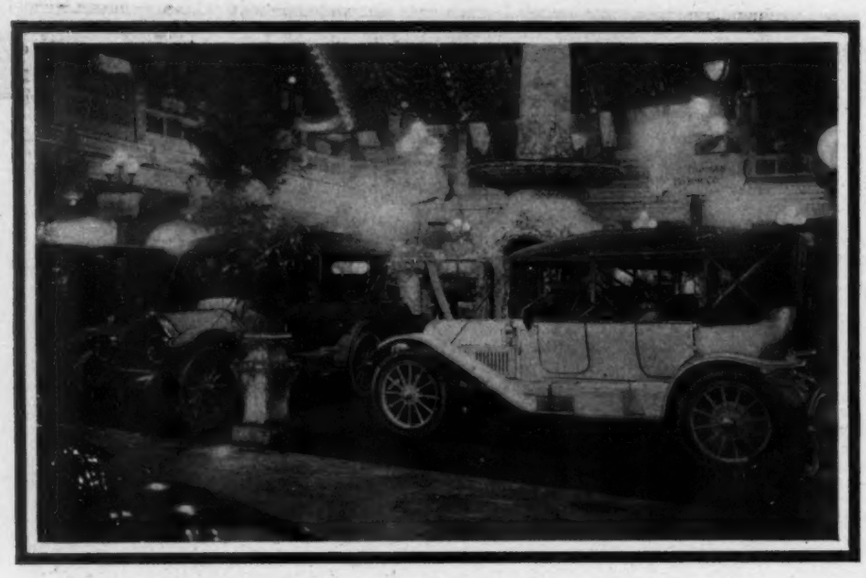
In past years there has always been more or less of a clashing of interests between the high-priced Eastern cars and the

HUGE COLISEUM, WHERE THE TENTH ANNUAL IS NOW IN PROGRESS

low-priced automobiles of Western manufacture. The superior finish of the Eastern product has always been a point of pride with the makers of that section, and the Western cars, turned out with the idea of quantity production, at least as strong as the desire for quality, have had to fight to gain as prominent a place in the eye of the public as has been enjoyed by their competitors.

This year, that situation has been corrected. Not only is there a vastly better feeling among the trade, notwithstanding the intense business rivalry, but the experience of the early years has resulted in many refinements of finish on the part of the Western contingent that makes any differences that may exist between the product of the manufacturers of

INTERIOR OF THE COLISEUM AT NIGHT



The Thomas exhibit was most favorably located in the Coliseum

that section and of the East almost imperceptible. The little things in which the East has enjoyed superiority have been adopted by the West, and at the Chicago show it would take more than a surface examination to differentiate between the best types of both sections.

While the opening night more than met expectations, even of the most sanguine, with regard to attendance and class, it remained for to-night's session to bring out the real business element. The visitors' names would read like the pages of the Chicago Blue Book and Directory of Directors. The men of millions, who personally made their millions were present in groups to inspect the last word in the line of motor cars for their personal or family use. They are no strangers to the automobile. They have owned cars ever since cars were worth owning and they would hesitate to be out of date, even by the margin of a single season in the style of their motor carriages. A nice discrimination in the matter of the car is possessed by the average Chicago business man. He knows merit when he sees it and he insists on getting it. Therefore, the prospects for a big trade during the show is certainly forecasted by the interest taken by the men of money.

From every point of view the show is a success. It marks another milestone in the history of the automobile, which in the record of world advancement constitutes the current chapter of the art of transportation. Civilization always has developed in response to each forward step in the means and methods employed by mankind in communicating and freight carrying, and the present show carves out one more step in the climb of progress toward ultimate perfection in those respects.

When the show closes on Saturday night the passenger cars will give place in the center of the spotlight to the freight-carriers. Just as the present section of the show exceeds all records in point of size and variety of exhibits and interest of the public, the coming display of the trucks has been planned along the same generous lines.

As appears in another part of this issue, the freight exhibition will be quite as notable as that of the pleasure cars.

Chicago's claim to being the largest show of the year is borne out by a count of the motor vehicles on display in the Coliseum, Coliseum annex, Coliseum basement and First Regiment Armory, which shows that the record so far as car representation is concerned has been broken.

Counting chassis and cars as a total, there are 355 gasoline cars and 40 electrics, giving a grand total of 395. The record has not been smashed by a very large margin, it is true, for there were 384 all told last year, but it must be remembered there were 13 commercial cars and chassis in the 1910 show, whereas this time the commercials have been saved for next week.

Comparing Chicago with the two New York shows—the one held in the Grand Central Palace and the other in the Madison Square Garden— it is discovered that again Chicago has the advantage. Counting everything in the palace, the independents only had a total of 184, while the Garden came closer with 320 for 67 exhibitors. Chicago has no less than 93 different makes of cars on view this year.

Going still farther back and taking 1909 into consideration, the statistics show that that year the N. A. A. M. show had on view 355 complete cars and chassis.

A trip through the Chicago show to-day developed interesting statistics as regards body types and it is surprising to note that the Armory has within a third as many cars on view as has the Coliseum proper. In the Coliseum there are 171 cars and chassis while in the armory there are 110. There are 37 in the annex and 55 in the basement.

Although this year's show has a bigger car total than last year's, still there are not as many chassis on view. Whereas a year ago there was a total of 71, this year there are 68, counting three electrics. The past year has seen a gain in popularity for the five-passenger car and a falling off in the four-passenger class. Last year there were 73 five-passenger cars, while this year there are 96. There are 51 two-passenger cars, mostly roadsters, whereas in 1910 there were only 35 on view. The seven-passenger also shows a gain, having jumped from 40 to 52. The three-passenger about holds its own, showing eight this time, whereas a year ago there were nine on view.

The show proves most effectively that the rumble seat has

Where the Locomobile legion foregathered during the show

gone into the discard. Makers who formerly felt it necessary to put on a rumble on a roadster now use the space either for a gasoline tank or a trunk.

Limousines are slightly more in evidence than ever before, there being 20 of these luxurious rigs on view as compared with 17 a year ago. The landaulet, however, has slumped to a certain extent, there being only five. The coupé is gaining in favor but not to the extent one might think by looking at the procession that nightly goes down Michigan avenue. Seven coupés are in the show as against only three in 1910. Just one six-passenger car is found.

The electric field has gained slightly in strength but not to the extent the critics might expect, for there are only seven more cars and chassis of this type in the two buildings, forty in all being shown. In the body line the couple body easily is the most popular, for of the 40, 18 are of this type, while only four victorias are displayed. There are exhibited eight broughams and three runabouts, while a novelty is a touring car.

Stearns cars were shown in fullest detail in the Coliseum

Several novelties in bodies are discovered, one of the most unique being the Duck Boat, as it is called, which is shown by the Speedwell. As its name implies, the body is shaped like a boat, with three individual seats, the rear one located in what might be termed the "stern" of the boat, being a comfortable looking one at that. The car is finished in mission style and has attracted considerable attention. The Stoddard-Dayton has what it calls its Sultan body, which also was shown at New York, an inside-drive affair with four individual seats; the Pierce-Arrow has its George Washington coach and the Packard its fore-door type of limousine. The Thomas also has a town car

Summing up the body statistics as noted at the show, the following results are obtained:

Type	1911	1910
Chassis—Gasoline	65	71
Five passenger	96	73
Four passenger	50	74
Two passenger	51	35
Seven passenger	52	40
Three passenger	8	9
Limousine	20	17
Coupe	7	3
Landaulet	5	8
Six passenger	1	0
Electrics	40	34

Overhead in the Coliseum there is little criticism to be made for the effects of the latticed ceiling with its indirect system of lighting is beautiful. The huge columns that tower from each of the four sections with their fountains and nymphs are rather of an artistic nature and the lanterns sprinkled in the various stands have a goblin-like effect.

Each booth is encircled by papier-mâché fence.

An artist taking the scene as a whole would regard the Coliseum as a masterpiece.

Leaving the Coliseum and going over to the Armory, one finds another improvement, in that the famous old wooden tube, that formerly connected the two shows has been done away with. The elimination of the pneumonia-breeding connecting link has resulted in the use of the alley itself as a broad walk, which takes the spectators from one building to the other.

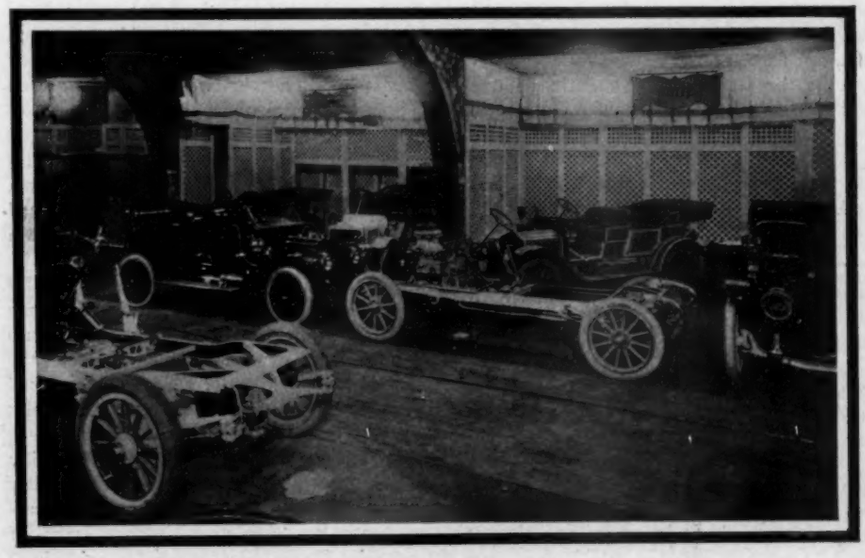
In the armory the scene is beautiful. The English garden idea that was used in the Coliseum last year has been moved here and the trees and foliage make a charming effect and form a natural background for the display of the cars.

The accessory displays in both buildings cover a wide scope and are perhaps more representative of the industry in general than the one in New York. The accessories occupy the gallery of the Coliseum, and the second floor of the annex, and the gallery of the armory. Most of these concerns will stick for the full two weeks.

This year the management has ruled that dealers' tickets will cost 50 cents each, the same anyone else pays, despite more or less comment from them.

There was noted a tendency on the part of purchasers to buy higher-priced cars than the ones which they now own. People with cars for which they paid $2,000, $2,500 or $3,000, after having used the machine for a year, feel that they now can afford to buy something a little better and in consequence of this belief they move into the $3,000, $3,500 and even $4,000 class, much to the delight of the makers handling such high-priced cars.

It is the same way all the way through. The advance is noted also at the other end of the line, users graduating from the $1,000 to the $1,500 class, and from the $1,500 class to the $2,000.



White gasolines and steamers were a center of attraction

1911 Auto in Simile

VASTNESS OF THE INDUSTRY TOLD IN A SERIES OF UNCOMMON COMPARISONS, EMPHASIZING THE SCOPE AND GENERAL IMPORTANCE OF TRADE

AGGREGATE figures related to any industry are always interesting, but those bearing upon American motordom are specially fascinating because each new set formulated strides forth into virgin territory at this stage of the industry. The total production of American automobiles of all classes and descriptions during 1910 was close to 187,000 cars. The total rated horsepower under the A. L. A. M. formula was 6,000,000 in round numbers.

If each car traveled an average of ten miles a day, the total mileage for the year of the new cars would be 682,550,000 or a little matter of 27,302 times as far as a distance around the world on the Equator, or over seven times as far as the Sun is from the Earth.

If a car does not do an average of ten miles a day, it is not giving full value to its owner, and those that accomplish less than that moderate figure are certainly compensated for in the totals by the cars that are driven forty or fifty miles each day and those that run 150 miles or more, once a week.

Running at twenty miles an hour, this vast pile of mileage would be accumulated in a half hour's time, leaving 23½ hours in each day for additions to the total. That the astonishing sum is unduly conservative, the fact may be noted that the tire man, a person who is concerned strictly with cold, hard facts, when he is guaranteeing his product to consumers, says that the average daily mileage is about 25.

On that basis the distance traveled by the cars of 1911 during one year would approximate 1,705,375,000 miles, or 68,215 times the distance around the world. Put in another way the figures would read: Akron, O., the centre of the automobile tire making industry, has a population of about 69,000. Now, if every person in Akron, O., possessed a car of 1911 make and there was a smooth broad boulevard along the course of the Equator from Quito on the West Coast of South America, across the Pacific, through the Philippines, touching Borneo and then shooting straight across the Indian Ocean to the African Coast, thence plunging into the wilderness of the Dark Continent, crossing the great lakes and silent forests to the sandy beaches of the Atlantic and straight across that body of water to Para, where the principal element of Akron, O.'s industrial prosperity is derived, thence through the dense Amazon jungles to the Andes and mounting the Cathedral-like heights on first speed, at length crawl over the summit of the passes over three miles in the air. Suppose that the whole city of Akron, seated behind the wheels of almost 69,000 automobiles of 1911, and having all the population of Evansville, Ind., sitting alongside it in the front seat to the left in most cases, but to the right where Fords and other left-hand drive machines were used. And then in the rear seats of the touring cars demi-tonneaus, rumbles, etc., suppose that the entire population of Chicopee Falls, Mass., some 25,000 souls were comfortably ensconced—the whole caravan could make the circuit of the earth as far as mileage is concerned, without equaling the actual mileage made by one year's product of the American automobile factories.

ALL AMERICAN AUTOMOBILES

Total automobiles in use in the United States: 440,000.
Estimated mileage for year: 4,015,000,000.
Estimated horsepower according to A. L. A. M. rating: 11,440,000.
Value: $500,000,000.
Estimated tire shoes: 2,412,000.
Gasoline consumption: 236,000,000 gallons.
Value of gasoline: $35,400,000.

But that is only a starter. Experience has shown that the average consumption of gasoline may be conservatively placed at about 17 miles per gallon. In some cases it is more and some less, but 17 miles to the gallon is not a wild figure. At that rate the tourists would use about 100,000,000 gallons on the trip, or about 3,174,600 barrels. This little item of freight would fill 31,746 freight cars of average size used by American railroads. Figuring 20 cars to a train and a train to a mile, the line of gasoline freight cars would stretch almost from New York to Denver and leave about 100 miles of track up toward Cheyenne, Wyo., to accommodate the freight trains loaded with lubricating oil.

Estimating the cost of the gasoline at 15 cents a gallon, which is also a shrinkingly modest figure, the total cost of fuel for the great Akron pilgrimage would be in the neighborhood of $15,000,000. In other words, the owners of 1911 cars would spend that amount in a year for gasoline, to say nothing of lubrication.

CARS OF 1911

Automobiles made in the United States in the year 1910: 187,000.
Estimated mileage for year: 1,705,375,000.
Estimated horsepower according to A. L. A. M. rating: 6,000,000.
Value: $307,788,910.
Estimated tire shoes: 1,380,000.
Gasoline consumption: 100,000,000 gallons.
Value of gasoline: $15,000,000.

Take the subject of tires. A mileage of 5,000 is guaranteed by many of the leading makers of shoes. Thus in the Akron pilgrimage, each of the 69,000 cars would require five sets of shoes in making the big trip. That is twenty tires for each machine or 1,380,000. Some tire makers claim that fewer tires would be needed, depending upon the kind used, but the fact remains that the cold hard guaranty is based upon 5,000 miles travel and it is to be assumed that the figures are not far wrong.

While the figurative tour of the world in the way outlined would present a magnificent array, which would stretch out in single file, with radiators almost touching tail lights for a distance of 125 miles, or five abreast in a solid column 25 miles long, the actual production of 1910 ranged along in the same way would make a continuous line 342 miles long, taking into consideration the fact that most of the cars engaged in the Akron trip were 110 inches long, while the general figure used for the total production is 116 inches. The American automobiles of last year would make four files of cars stretching from Jersey City to Camden, N. J., in unbroken array. If these cars weigh 2,500 pounds each, the excellent Jersey roads over which they are strung for purposes of illustration, but not actually on account of the stringent State law that prohibits the entry of outside cars upon the sacred soil and precincts of Jersey without paying $1 per car for the privilege of so entering for any period

of time from one second to eight days, the aforesaid excellent roads would bear a burden of 233,570 tons or 467,500,000 pounds, which is an approximate total of the weight of the cars.

The list price of the American automobile of last year was $1,645.93, therefore the value of the Jersey parade would be in the neighborhood of $307,788,910. Quite a tidy sum from any point of view.

If anyone started out to pay that bill in $1 silver certificates, which weigh 22 to the ounce, or 352 to the avoirdupois pound, he would have to carry a bundle of money weighing something less than 500 tons. If he paid it in $5 bills his "roll" would be about 100 tons, and if he had nothing but $100 bills, the pile would represent a small matter of only five tons. On the other hand if only $5,000 bills were used, 200 pounds would represent the load, while if $10,000 certificates were the currency involved, a modest little roll of 100 pounds would more than pay the bill.

If it were paid in silver—but what's the use?

Intelligent travel is rated as one of the highest educational elements that is applicable to humanity and the possibilities of the automobile in this direction have only been scratched, but already the vogue of the motor has begun to make itself felt in another direction. In former years, in fact as long ago as history makes any record of the social progress of man, the medical profession has been known as the most lucrative as well as one of the most honorable to which a man might devote himself. Even among savage tribes the medicine man was rated in influence next to the chief or king. To a large extent the medical fraternity still enjoys distinction, but a careful compilation of the figures shows that on the general average it has decreased in productiveness during the years the automobile has been a factor in commercial, industrial, social and hygienic life. This may be due to two facts: First, the progressive element among the physicians who adopted the automobile for use in extending and attending to his practice soon achieved remarkable results financially, and second, the fact that a big element of the population that formerly contributed most generously to the physicians have taken up motoring and do not need so much service as they did before.

TRAFFIC FIGURES FOR YEAR

- Car shipments and materials: 200,000 carloads.
- Passing at the rate of four a minute, would require over 34 days.
- Carloads of gasoline: 70,000.
- Trains necessary to carry cars: 10,000.
- Trains necessary to carry gasoline: 3,500.
- Passenger miles per year: 12,045,000,000.
- Giving per capita mileage for United States citizens of over 120 per year.
- Distance represented: 481,800 trips around world.

At any rate, the statistics show that the young doctor who does not own a car has about the same chance of equaling the earnings of his father, or the practitioner of twenty years ago, as does the operator of a horse-drawn hack in New York City to equal the earnings of a first-class taxicab.

Then, too, another bunch of statistics tend to show that the man who owns an automobile and uses it can credit his gasoline and repair bills with a material sum each season, representing the saving in doctor's bills. All of which is comforting to the car owner, despite the fact that it may not be so pleasant for the doctor.

It may be said with conviction that there is a much wider general knowledge of the United States today in the heads of its leading men and women than ever before in the history of the country. This is due to the personal element involved in traveling from place to place in the 440,000 cars now in use throughout the land. Taking three as the average load of the car, it is not too much to say that almost 1,500,000 persons ride 25 miles each day in automobiles, or 37,500,000 miles of personal travel each day of the year.

THE INDUSTRY

- Number of companies making gasoline passenger cars: 137.
- Number of companies making cars and accessories: 11,165.
- Machine tools required in car building: 135,000.
- Annual value of tires: $100,000,000.
- Men engaged in manufacturing cars: 187,000.
- Thus it takes one man one year to turn out a car.
- Dependent directly upon these employees: 935,000 persons.

It is said that there are 31,000,000 horses of all sorts and descriptions in the United States. If one-third of the population should ride these horses one mile each day, the same amount of travel would be accomplished. Of course that is unthinkable and the main interest in the tremendous fact lies in the conclusion that but for the automobile, all that travel would have been lost. Its educational value would be nullified; its healthful tendency never would have been felt and the world would have been the loser in the exact measure of the benefits that are now enjoyed.

A recent article in THE AUTOMOBILE told of the traffic work of the National Association of Automobile Manufacturers. In this article it was stated that 100,000 carloads of automobiles were shipped each year by the American railroads and that the other freight shipments during a year that arose out of the motor traffic were more than 100,000 carloads additional.

In tracing the effect of the injection of the automobile industry into the commercial life of the country, the lines ramify amazingly and lead the investigator into places of which he had no idea as regards the automobile.

Ten years ago there were a dozen sleepy little towns in various places in the United States that are now growing like a ten-year-old boy; humming with industry like hives of bees and full of life and activity and prosperity—due solely and entirely to the advent of the automobile. The number of men engaged in the industry may be placed at 150,000 for the purpose of illustration. As a matter of fact the actual figures are larger. The conclusion of political and social economists who have studied industrial situations and conditions, is that five persons depend upon the earnings of each workman. That would make a total of 750,000 persons directly dependent upon the making of motor cars for their daily bread and butter. Bread and butter and clothing and house rent constitute the bulk of their expenses and the barter and trade in these commodities is the backbone of business of the land. Supplying the needs of three-quarters of a million persons is a big item of business and requires the services of thousands of tradesmen in all lines; manufacturers of various kinds and the production of thousands of farms.

CURIOUS COMPARISONS

- It would take 100 pounds of $10,000 bills to buy the year's product.
- New American cars four abreast would stretch across New Jersey.
- Gasoline for these cars would require 31,746 freight cars to ship.
- In trains they would reach from New York to Denver.
- Jersey licenses for one minute visit: $187,000.
- Average cost of cars is lower: $1,645.93.
- Year's output weighs about 467,500,000 pounds.

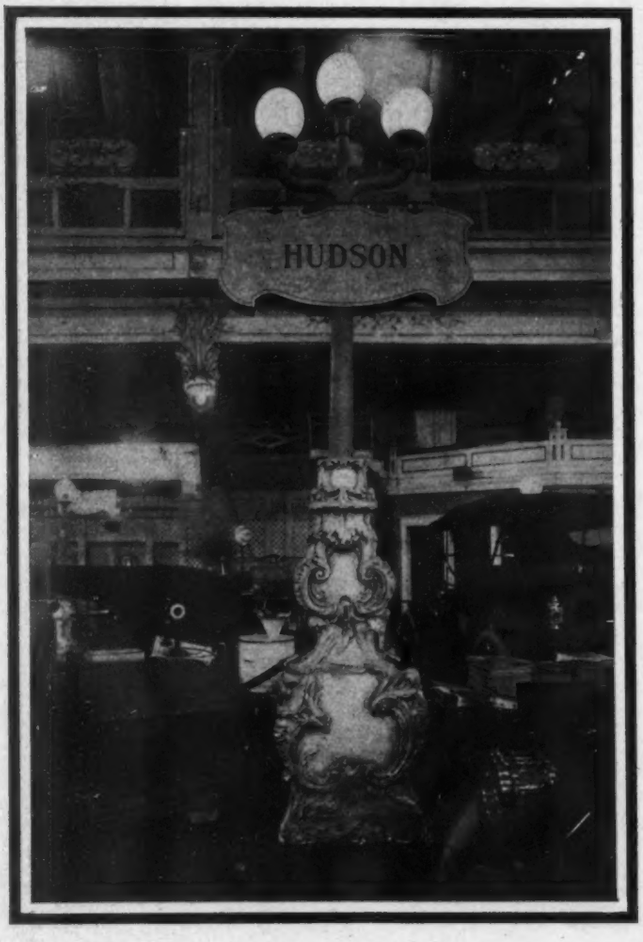
Details of Cars

STRUCTURAL DATA OF PASSENGER AUTOMOBILES ON DISPLAY IN BOTH BUILDINGS

FOLLOWING is a brief summary of some of the chief mechanical features of the various cars shown in both divisions of the Tenth National Automobile Show at Chicago. The list is exhaustive and is about as complete as it can be made, although nothing is treated at length. Most of the models described are in the Coliseum, but a considerable number of them are in the First Regiment Armory:

Alco—A Venturi-type carbureter is fitted in which the needle valve is raised in the nozzle through a diaphragm, which diaphragm is actuated by the motor suction. For the Bosch dual ignition system a 6-volt starting battery has taken the place of a 4-volt type of last year. The crank-case of the motor is now mounted horizontally in the chassis instead of being lower at the rear end as formerly. The radius rods between the rear axle housing and frame are now I-beam forgings. They are hinged at the front end and revolubly mounted on the axle forging at the rear. The four-cylinder Alco carries the several improvements as the six and has cylinders 5 1-8 by 5 1-2 inches, bore and stroke; these sizes were 4 3-4 by 5 1-2. This is one example of increasing the bore and leaving the stroke the same. All models are fitted with Continental demountable rims.

American—A most important addition to the American lines is a coupé type with left-hand control, the emergency brake and change-speed lever being placed in the center of the floor-board, so as to be operated by the right hand. This model uses an under-slung frame. In its regular chassis a few refinements have been made for this year. A Bosch dual ignition system is fitted, the cylindrical coil with switch being carried in the toe-board and flush with the surface. A kick switch is used on the coil. Rubber inserts have been placed in the clutch beneath the asbestos facing. A change in the gearbox is the introduction of spiral gears for driving from the main to the countershaft.



Some of the Decorative Effects

Amplex—A lengthening of the wheelbase from 117 to 128 inches, increase of bearing surface throughout the motor, increased length of springs, and entire new design of frame are the chief changes for 1911. The frame is of pressed steel heat treated with very wide flanges, where the side members narrow down in front. The gear-shifting mechanism is entirely enclosed. New style of oilers are fitted with means of increasing and decreasing the flow from the dash. An air-starting device, which is standard equipment, consists of a combination air pump and air valve on the rear cylinder. Double ignition is employed, with a Bosch high-tension magneto to one set of plugs, and a Bosch independent synchronous battery system to another set. Shock absorbers are standard equipment, and a fore-door body may be fitted to all models.

Atlas—The Atlas Motor Car Co. has simplified its oiling system by substituting a roller bearing for the plain bearing in the crankshaft connecting rod. These bearings, together with the pistons, are lubricated by putting a smaller amount of oil in the gasoline tank with the gasoline. The crankshaft is a one-piece

Seen at Chicago's Coliseum

drop forging of chrome vanadium steel. The revolving disks of the crankshaft have been eliminated. The system of transferring a charge to the cylinders has been improved by piston heads with only two depressing channels and transfer ports in place of four. The cylinders are cast in pairs with the centers much closer together; the crankcase and ends are one aluminum casting.

Auburn—The Auburn, made by the Auburn Automobile Company, of Auburn, Ind., shows a wheelbase increased from 116 to 120 inches. A cone clutch has been substituted for a disk, while three-quarter elliptic instead of elliptic springs are used. The Auburn people continue to use in their big car their 4 1-2 by 5-inch motor, which they manufacture themselves. They also have a 30-horsepower model with a 4 by 4-inch motor of Rutenber design, but they are pushing the larger car. The body fashions run in a five-passenger fore-door, five-passenger touring car, and a four-passenger close-coupled in the larger model and the same thing in the 30-horsepower line.

Austin—Three high-powered chassis and a variety of body styles are included in the 1911 product of this company. The motors are all six-cylinder, four-cycle engines with measurements as follows: 4 3-8 by 5 1-4, 4 1-2 by 6 and 5 1-2 by 5 1-2 inches, rated at 45.9, 48.6 and 72.6 horsepower. Wheelbases range from 126 to 147 inches, and the cars carry from five to seven passenger seats. Cylinders are cast separate; multiple-jet carbureters; gravity feed; pump lubrication and multiple-disc clutch are mechanical features.

Badger—This new line is presented on one type of chassis

NEARLY ALL THE WELL-KNOWN CARS ARE ON EXHIBITION

At Chicago Show

with a variety of body designs. The motor is rated at about 30 horsepower and is of the four-cylinder, four-cycle type. The ignition is by Bosch dual system with storage battery and coil; axles, front, pressed steel; rear, full floating; wheels, 34 by 3 1-2; wheelbase, 112 inches; springs, semi-elliptic in front, three-quarters in rear; transmission selective, sliding gear, and equipped with special Rayfield carbureter.

Benz—The Benz product for 1911 includes a variety of motor sizes and powers and a number of body types. The motors range from 18 to 50 horsepower. Touring cars, roadsters, torpedos and enclosed bodies are offered. Special attention is paid to the upholstery as well as the mechanical refinements of this line.

Brush—Among the changes to be found in the Brush cars the waterjacket space around the valve chambers is increased so that the valves will be less affected by the heat. There is a slight change in the material used in the clutch disks, whereby greater wearing qualities and smoother action is obtained. The transverse tie-rod of the steering gear has adjustable yokes instead of brazed joints, the yokes now being threaded and locked by a clamping bolt. No other mechanical changes are to be found, except that the wheels on the roadster models have been increased from 28 to 30 inches in diameter.

Buick—The characteristic features of the Buick cars remain

unchanged for the coming season, except that an automatic high-speed clutch releaser is fitted to the models having the two-speed planetary gearsets; practically all wheelbases are changed; the full-elliptic rear springs on the larger models have given way to semi-elliptics; wheel dimensions of the larger models have been increased from 34 x 4 to 36 x 4 inches; there are changes in the carbureter and magneto equipment; and a new chassis model is brought out which is equipped with a 4-inch square motor. The old two-cylinder model on which the Buick reputation was founded is not listed in the 1911 catalogue. The features of the new model are a regular Buick valve-in-the-head type of motor; power is transmitted through a multiple-disc clutch.

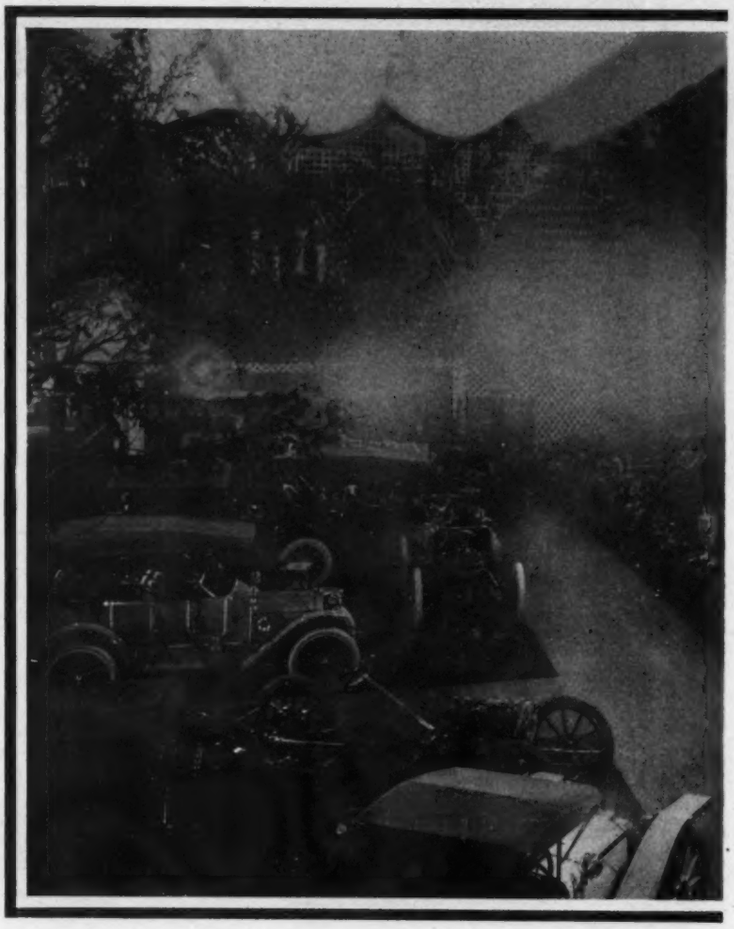
Cadillac—Cylinders have increased in diameter to 4 1-2 inch square. A change has been made to the babbitt-lined bronze bearings used in the 1909 models. The crankshaft is increased in diameter and the bearing surfaces longer and increased in area. The radiator is larger, and one-piece copper water manifolds have replaced the T's on the cylinders and their series of rubber hose connections. A larger water-jacketed Schebler carbureter is used. The flywheel is also larger and heavier. In the clutch two incased universal joints between the clutch and gearset have been adopted. In the rear axle the driving pinion and driven gear are increased in size. The propeller shaft contains two universal joints instead of one and a torsion rod is fitted to the rear axle instead of a torsion tube. The new rear axle is a floating type instead of semi-floating.

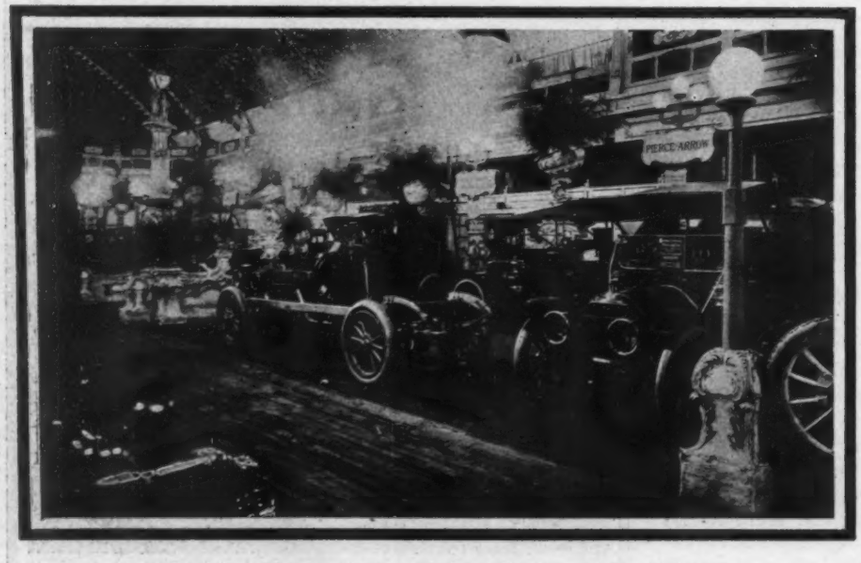
Cartercar—The Cartercar Company will not invade the commercial realm this year, but offers four models, one a 40-horsepower, one a 35 and two 30's. The Carter friction transmission is a feature of the line, and in all four models various refinements are to be noted, although no radical departure from the conventional has been made by the Cartercar Company.

Case—None of the 1910 Case cars has been carried over and the offering of this concern consists of a 30-horsepower chassis in which are larger and stronger timing gears. The camshaft and cams are a one-piece drop forging, while the timing gears are bolted to a flange which is solid with the camshaft. The camshaft and timing gear can be removed without dismantling the motor, while all the bearings are die cast white bronze. The water pump is centrifugal type and with the magneto is located on the left side. The steering gear and carbureter are on the right side. Six different types of bodies are furnished on this one chassis.

Chadwick—Most of the changes in the 1911 Chadwick are found in the motor, the inlet valve being much larger and placed in the cylinder head, so that rocker arms are used to operate

General View of the Exhibits





The Pierce-Arrow display on the main floor of the Coliseum

them. The company claims 15 per cent. additional power by this construction. A heavier crankshaft is used because of this increase in power. The motor timing gears are of hardened steel and the exhaust camshaft is fitted with a lever for shifting the entire shaft, including the gear, endwise, so as to bring an extra set of cams under the exhaust valve lifters to relieve the compression for starting. The capacity of the mechanical oiler has been increased to 2 3-4 gallons. A hot-water jacket has been placed around the inlet pipe to prevent condensation, the supply pipe for this water being carried through the middle of the intake manifold to get the greatest benefit from the heat.

Chalmers—Model 30 improvements are: Pushrods heavier, each cylinder carries larger priming cup, wiring system simplified, propeller shaft is made with two universal joints and is paralleled by a pressed steel torque rod. A new rear axle with a pressed steel housing has been

in the First Regiment Armory

added. It is of the complete floating type. The dash has only a glass bull's eye, 1 1-4 inches in diameter, as a sight feed and the circular end of the Bosch coil. The dash is now square. Front and rear fenders have been made specially strong. In the Chalmers 40 a Bosch dual ignition system has replaced the double system. A strainer is fitted in the gasoline line between the tank and carbureter. There is a new universal joint between the clutch and gearbox. All valve springs are encased. The controls on the steering wheel work on a plain semi-circular ring, being held in position by friction. The steering column is heavier. The fender and dash improvements of the 30 are incorporated on this model.

Cino—This Cincinnati car, made by Haberer & Company, of that city, is shown on one-chassis type this year. The motor, a four-cylinder, four-cycle engine, has cylinder measurements of 4 3-8 by 5 inches, cast in pairs and cooled by centrifugal pump and tubular radiator. High-tension magneto, splash lubrication, cone clutch, shaft drive, three-speed selective transmission and tires 34 by 4 inches are a few of the details of the line. The wheelbase is 113 inches. The engine is rated at 34.2 under the A. L. A. M. formula.

Colby—A long-stroke motor, with cylinders measuring 4 1-8 by 5 1-4 inches, is the feature of this company's product. The engine is of the four-cylinder, four-cycle type, cooled by centrifugal pump, water circulator system and rated at 27.2 horsepower. Bosch high-tension magneto is employed in the ignition; Stromberg carbureter; circulating pump system of lubrication; a multiple-disc clutch; three-speed selective transmission and shaft drive are some of its details. The tire equipment is 36 by 4 inches in the main.

Cole—A year's experience has farther improved these cars and added power and strength to the models. Using a three-point suspension, it has increased the cylinder dimensions from 4 by 4 to 4 1-4 by 4 1-2 inches. Besides it has tipped the motor 2 1-2 degrees with respect to the horizontal, and it claims the horsepower has jumped from 30 to 36. L-type cylinders cast in pairs are used. The wheelbase has been increased from 108 to 118 inches and 34 by 4-inch tires are used instead of 32 by 3 1-2. Demountable rims now are part of the equipment. The rear axle is of the full floating type and Hyatt roller bearings are installed. In the three-point suspension of the power plant it is noted that the third or pivot point is at the front end of the motor and just under the crankcase. The other two supports are heavy aluminum arms, which are cast integral with the flywheel housing and rest on cast-iron blocks inside the side rails of the main frame.

Columbia—One change in the Columbia is a new model mark 85, in which a double set of jump spark ignition has taken the place of the low-tension make-and-break system heretofore used exclusively on these models. Two sets of spark plugs are used, the one set receiving its current from the Bosch magneto, the other from a battery through a timer distributer and a Bosch non-vibrating coil. An elaborate circulating system of lubrication is used. A cork float carrying an indicator shows the oil level in the crankcase. The motor, with its 4 7-8-inch bore and 5 1-2-inch stroke, has a right to be entered in the long-stroke classification, in that the stroke exceeds the bore by 5-8-inch. On the Mark 48 Columbia, which model is continued from last year, the Bosch low-tension ignition system is maintained, but a high-tension set is also fitted.

Corbin—The cylinders of the new model are of T-shape, cast in pairs. A complete circulating oiling system with the flow

Where the Packard holds forth on the Coliseum main floor

THE AIR-COOLED FRANKLIN WAS INSTALLED IN PRETTY SURROUNDINGS

maintained by a circulating pump driven by bevel gear from the rear end of the camshaft. This gives force feed to the three crankshaft bearings and the lower bearings of the connecting rods. The gears and shafts are made from chrome nickel steel. A new rear axle design is used, made up of a pressed steel housing, formed in halves, which are electrically welded together. The differential and pinion with shaft are mounted as a unit in a casting which bolts into the axle housing. A change has been made in the support of the motor, which is now hung direct on the side members of the frame. Last year the gearbox was carried on this steel pan but is now carried on two cross members of the frame.

Crow—From two to seven passengers can be accommodated in the line of Crow cars of 1911. These range from a roadster to a commodious torpedo-bodied touring car. The chassis have four sizes of motors, the cylinders of which measure as follows: 4 by 4 1-2, rated at 25.6 horsepower; 4 1-8 by 4 3-4, a 27.2 engine; 4 1-4 by 4 1-2, rated at 28.9 horsepower, and 4 3-8 by 5 inches, at 30.6 horsepower. This car was formerly known as the Black-Crow and is manufactured at Elkhart, Ind.

Diamond T—The 1911 model of this make is equipped with a specially built Continental motor of four cylinders, 5 by 5 1-2 inches and rated at 40 horsepower under the A. L. A. M. formula. The motor is of the four-cycle water-cooled type, with cylinders cast in pairs. A multiple-disc clutch running in oil; selective gearset giving three forward speeds; two metal-encased universal

The Winton exhibit, as usual, was most complete and effective

At the Overland stand the entire line was displayed

THE PEERLESS DISPLAY WAS ONE OF THE MOST EFFECTIVE IN THE COLISEUM

The Moline exhibit came in for a large share of attention

Stevens-Duryea cars were shown in fullest detail

joints in the propeller shaft; full floating rear axle and 126-inch wheelbase are some of the mechanical features. The tire equipment is 36 by 4 1-2 inches.

Dorris—This line, which is rather unfamiliar to the East, is presented this year on a single chassis. The motor is four-cylinder, four-cycle type, with cylinders 4 3-8 by 5 inches, cast in pairs and cooled by centrifugal pump and tubular radiator. Conventional lines are followed in its construction. Open and enclosed bodies are used in variety. The engine is rated at 30.6 horsepower.

Elmore—An addition to the Elmores is Model 25. Means are provided for regulating the timing of the gas distributer ports. A high-tension K. & W. magneto system has been added to the single Atwater-Kent system previously employed. Improvements are to be found in the carbureter design, a hot-air pipe extending from a jacket on the exhaust manifold to the air intake of the carbureter replaces the exhaust gas jacket used heretofore; needle valve adjustment previously located on the dash is now in a convenient position directly below and in front of the driver's seat. A new priming device is fitted to the motor, by means of which all the cylinders can be simultaneously primed by merely operating a rod on the dash. The expanding ring clutch, previously used, is now replaced by a multiple-disk type arranged in unit with the gearset, its disks being of bronze and steel, with cork inserts and lubricated by the grease from the transmission.

E-M-F and Flanders—Roadster and demi-tonneau bodies are new with this

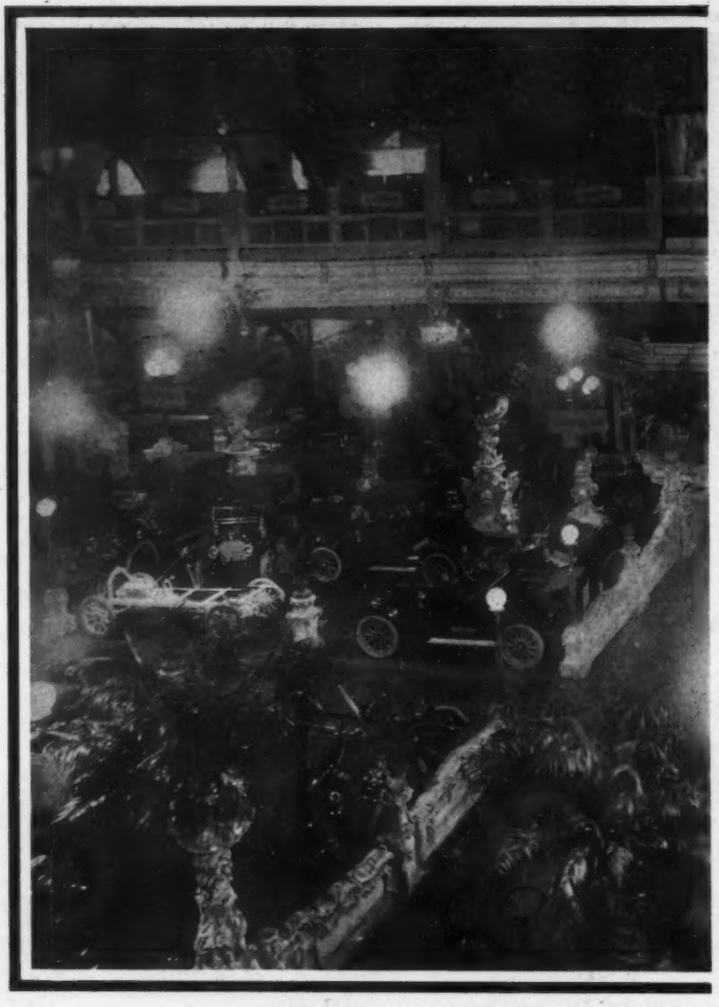
company, which has not changed the chassis except to give a lower angle of rake to the steering column of the two new models. The roadster has bucket seats and a large gasoline tank in the rear, while the demi-tonneau differs from the roadster only in the seat arrangement, a tonneau accommodating two persons being substituted in the rear in place of the large gasoline tank in the rear locker. In this model the tank occupies a position under the front seat. A scuttle dash is used on both these models. The Flanders, also made by this company, has been refined and improved for 1911 and comes in runabout, roadster, suburban and coupé types.

Enger—Six distinctive body styles on one chassis is the offering of this company for 1911. The motor is four-cylinder, four-cycle, cast in pairs and is water-cooled by gear driven pump through syphon system. Force-feed lubrication on the constant level splash system idea; Schebler carbureter; high-tension magneto; multiple-disc clutch; three-speed selective transmission; shaft drive; semi-floating rear axle; wheelbase, 116 inches and tire equipment, 36 or 34 inches by 4, are some of the details of construction.

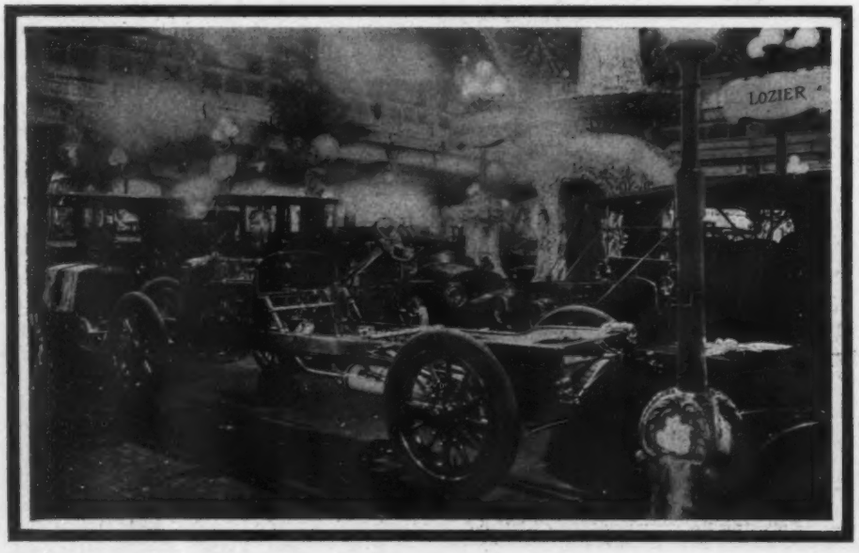
Everitt—The Metzger Motor Car Co. has devoted its time filling out its line by furnishing six distinct styles of bodies, taking in the popular ideas ranging from a roadster to a fore-door touring car, and also including the light delivery wagon. A feature of the Everitt idea of the fore-door construction is the fact that everything is inclosed and the only thing shown outside of the car is the door handle. The control levers are within easy reach of the driver and have sufficient clearance to overcome any chance of striking the door. In the chassis few changes are noted, the company still continuing the long-stroke motor with the cylinders cast en bloc. One of the features here is that the magneto and pump supports are cast en bloc with the upper half of the crankcase and do not need to be disturbed when removing the lower half of the crankcase.

Falcar—The feature of the Falcar 1911 line is the long-stroke motor used. The four-cylinder, four-cycle engine is rated at 27.2 horsepower, and the cylinder measurements are 4 1-8 by 5 1-4 inches. Two, three, four and five-passenger bodies of various styles are used to equip the line. While the difference between bore and stroke is not so pronounced as in some of the current models of foreign cars, it is quite striking in comparison with most of the American automobiles.

Fiat—Motors of 15, 25, 45 and 90 rated horsepowers constitute the 1911 line of this concern, which has recently opened its factory at Poughkeepsie, N. Y., in addition to its Italian plant. One of the 45-horsepower motors is of six-cylinders, but the remainder are of the four-cylinder, four-cycle type. The smaller cars are shaft driven and the larger chain driven. Simplicity is the keynote of the line. The body styles are varied and numerous.



SCENE LOOKING ACROSS THE COLISEUM



Lozier patrons flocked here to see their favorite

Franklin—The hood is a new Renault type with open grill in front instead of the round design. In the motor there are now two separate valves in the head of each cylinder, arranged side by side and operated by rocker arms. The trombone design of intake pipe is now used on all models. The shafts of the engine gears at the rear end of the motor are mounted on the rear motor support, which is further to the rear and has a deeper vertical flange. In the lubrication system there is a lead to each of the main crankshaft bearings. The crankshaft is drilled to form ducts for the lubricant to the lower connecting-rod bearings. On the six-cylinder models the carbureter has an auxiliary air valve and an accelerator.

FROM THE ACCESSORIES GALLERY

Semi-floating axles are used. The wheelbases have been lengthened. Changes are also to be found in the cylinder dimensions.

Garford—For the first time in its history as an automobile maker the Garford company has built its own bodies, having erected a special building for this work and purchased a body-making concern which it has moved, with the laborers, to its factory. The Garford chassis has been altered in several minor respects. In the motor a V-section fan belt has replaced the flat type. The floating rear axle is a tubular construction, each axle sleeve being a funnel-shaped seamless steel tubing which bolts at its larger end to the differential housing, braking not entering into the make up of the axle in the present form.

Glide—The Bartholomew Company, of Peoria, Ill., is showing a medium-priced line, including seven and five-passenger touring cars, roadsters and a fore-door touring type. The motor, rated at 36.1 horsepower, is a four-cylinder, four-cycle engine 4 3-4 by 5 inches. The cylinders are cast singly. The cooling system is by rotary pump and honeycomb radiator. Ignition is by high tension magneto and storage batteries. Splash lubrication; multiple-disc clutch; three-speed selective transmission; shaft drive; wheelbase, 120 inches; tread, 56 or 60. The frame is of pressed steel and tire equipment of the bigger models, 36 by 4 1-2 inches.

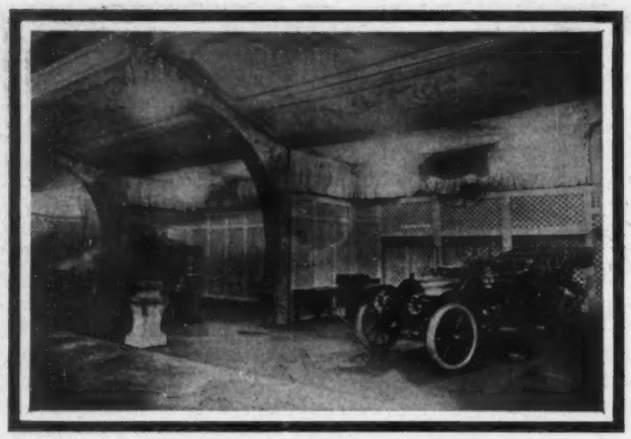
Great Western—The Great Western product for 1911 is equipped with but a single size of engine. This is a four-cylinder, four-cycle motor, the cylinders of which measure 4 1-4 by 5 inches. They are cast separately. Mechanically, all the models shown are similar in construction and dimensions, except that the big torpedo body has tires 35 by 4 inches, instead of 34 by 3 1-2, as in the other models of this make of car. The body styles cover a wide range from roadster to big touring car.

Halladay—Three chassis and a dozen body styles constitute the Halladay 1911 offerings. The motors have cylinder measurements as follows: 4 by 4, 4 1-2 by 5 and 4 3-4 by 5 inches. These are rated, respectively, as 25.6. 32.4 and 36.1 horsepower under the A. L. A. M. formula, all being of the four-cylinder, four-cycle type. The cylinders are cast single and construction otherwise is standard. Wheelbases range from 104 to 128 inches. The cars are arranged to carry from two to seven passengers.

Haynes—In the Haynes models all valve springs are encased. Engine and gearset gears are ground and cylinders are both ground and lapped. The water pump has been located more accessibly by raising the shaft a trifle, which drives it and the magneto. The fan adjustment is improved. The radiator is 1 1-2 inches higher. There is a ring around the fan blades to increase their rigidity. Slight changes are found in the oiling system in that a large glass, showing the oil level in the crankcase, is situated at the right front of the case. The filler pipe is now located between the cylinder castings. A Bosch dual ignition system is fitted with a new combination coil and switch passing through the dash, which is provided with a lock. A Schebler carbureter is used. The wheelbase is increased from 110 to 114 inches.

Hudson—The 1911 Hudson is entirely new. It is characterized by a monobloc four-cylinder motor, with valves on the left side. This motor has a cross shaft in front on the left end of which is the water pump, and on the right end the magneto. The gearbox is a unit with the motor, being anchored thereto through a pair of spreading arms which surround the flywheel and bolt direct to the rear of the crankcase. The top of the water jacket is a large casting which forms the return water pipe. In the ignition

The National, its crack drivers and many trophies were in evidence



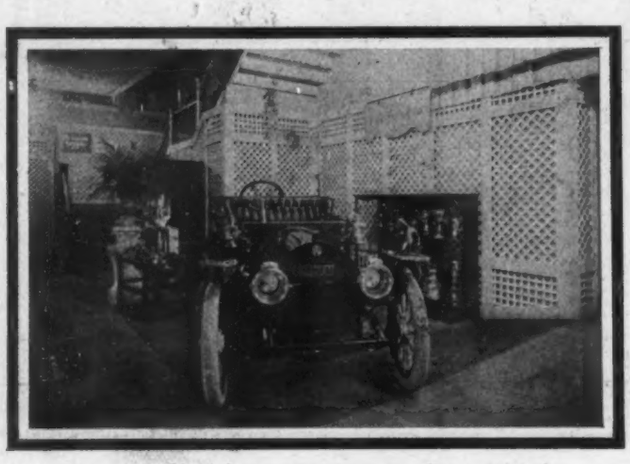
The Matheson display was neat and effective

system the wires are carried in a horizontal tube over the cylinder heads, this tube extending rearward until almost end to end with the cylindrical Bosch coil. The carbureter is at the opposite side of the motor to the valves, and the intake pipe passes through the waterjacket between the second and third cylinders.

Hupmobile—A new model, which is a four-passenger touring car built the same as the 1910 Hupmobiles, except that the propellershaft, radius rods and frames are lengthened and increased in strength. The wheelbase is 110 inches. The other Hupp models have wheelbases of 86 inches. Power is furnished by the same four-cylinder unit power plant which has been characteristic of Hupmobile construction since its invasion of the field three seasons ago. The tension of the clutch spring is now made adjustable by using three plugs which screw into the end of the clutch hub and bear against the end of the spring.

Inter-State—To meet the demand for a large touring car a new chassis model has been added, which is known as the model 35. This is equipped with a torpedo touring car body of a roomy fore-door type. The features of this new model are a water-cooled T-type motor with a 4 3-4-inch bore and 5-inch stroke, which is claimed to develop 50 horsepower at a normal speed of 1,200 revolutions per minute. The cylinders of the motor are cast in pairs, mounted on a crankcase having three-point suspension. Cooling of the motor is assisted by a centrifugal gear-driven pump, a cellular radiator and adjustable belt-driven fan. Lubrication is by means of a circulating oiling system. Ignition is by means of a double jump-spark system. A multiple-disc clutch in unit with a selective gearset giving three forward speeds transmits power through a drive-shaft inclosed in a torsion tube to the full floating type rear axle.

Jackson—In body styles the Jackson offers a convertible torpedo body, which can be converted into a fore-door type because the front doors are removable. The Jackson company retains the unit power plant idea throughout and the circulating system of oiling again is a feature. The frames on models 51, 41, 35 and 30 have been dropped, bringing the weight close to the ground.



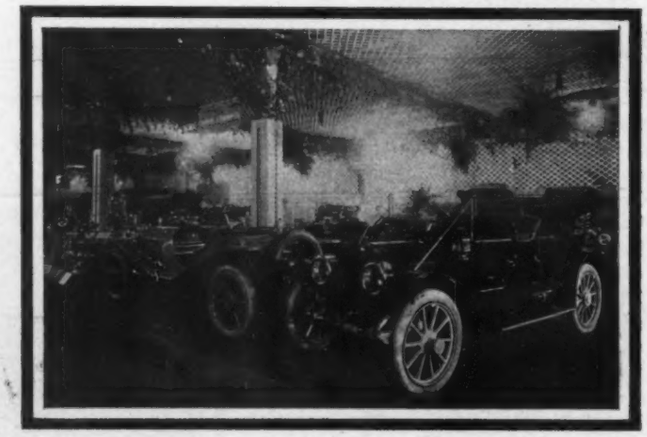
Many trophies were in evidence at the Falcar stand

Kenmore—One of the few two-cylinder passenger cars of 1911 is the Kenmore line. The motor is 4 by 4 inches, with cylinders opposed, rated at 12.9 horsepower by A. L. A. M. formula. The car has high-tension magneto and auxiliary ignition system; Schebler carbureter; cone clutch; two-speed planetary transmission; semi-floating rear axle and a wheel-

The Jackson exhibit was one of the most effective in the Annex

base of 82 inches in this model. The Kenmore is offered in several body styles, one of which has a somewhat larger motor of the same general kind. The tire equipment is 32 by 4 inches for the larger type.

Kisselkar—The most important change in the Kisselkar construction for 1911 is to be found in the oiling system, the mechanical oiler having given way to a self-contained circulating system with an adjustable oil level, and a glass-float indicator



The Marmon stand was the Mecca of the racing contingent

is provided at the left side of the crankcase to show the level of oil in the reservoir. A foot accelerator is fitted to all models except the LD 11. Clutch-operating pedals are adjustable. An improved universal joint encased in leather and packed in grease is employed between the clutch and gearset. Brakes are of the external and internal type, instead of two internals located side by side, and the braking surface is practically doubled. A double drop frame replaces the single drop construction. The steering gear tire rod is located behind the rear axle, and the steering arms above it.

Klinekar—Both four and six-cylinder motors are included

in the extensive line of the B. C. K. Motor Car Co. for 1911. Three sizes of four-cylinder motors and two of the six-cylinder type are comprised in the line. The cylinders measure as follows: 3 3-4 by 4 1-4, 4 by 4 1-2, 4 1-4 by 5 1-4 and 4 3-32 by 5 inches. The first three are the four-cylinder engines. The other "six" is 4 1-4 by 5 1-4. The body designs are comprehensive in style and number, and arranged for two, four, five and seven passengers. The big six has 38 by 4-inch tire equipment.

Knox—Among the few changes to be found in Knox cars is a heavy I-beam arched cross member which is arranged across the frame at the rear end of the motor above the crankcase. A

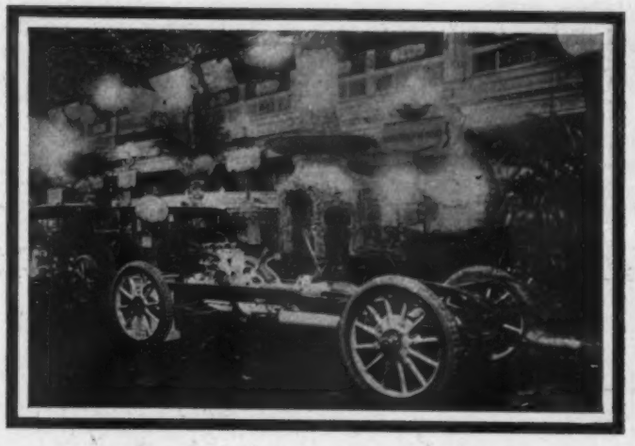
Halladay cars were shown in fullest detail

slight change also is to be found in the shifting mechanism of the gearset in that the cross rod from the levers to the top of the gearcase extends across the top of the case. A full floating rear axle, such as was used on the six-cylinder models of 1910, is now fitted on all four-cylinder models as well; new brake band supports of an anti-rattler spring design are fitted to hold the brake bands away from the drum when not in use, and a triangular torsion tube is added to relieve the springs of torsional

Where the Brush enthusiasts were wont to congregate

strains and improve the riding qualities of the car. The wheelbase is somewhat lengthened.

Lambert—The Lambert company is so well satisfied with the success it has met with friction transmission that the same idea is retained for 1911, with only one or two minor changes. There are four chassis types, which carry six different models, which are alike except that in model 100 a four-cylinder Rutenber motor is used, while in the other models the four-cylinder engine is of the en-bloc type with ball-bearing crankshafts. This model 100 is practically the same as model 47 of 1910, except that the frame is reinforced with truss rods and external-



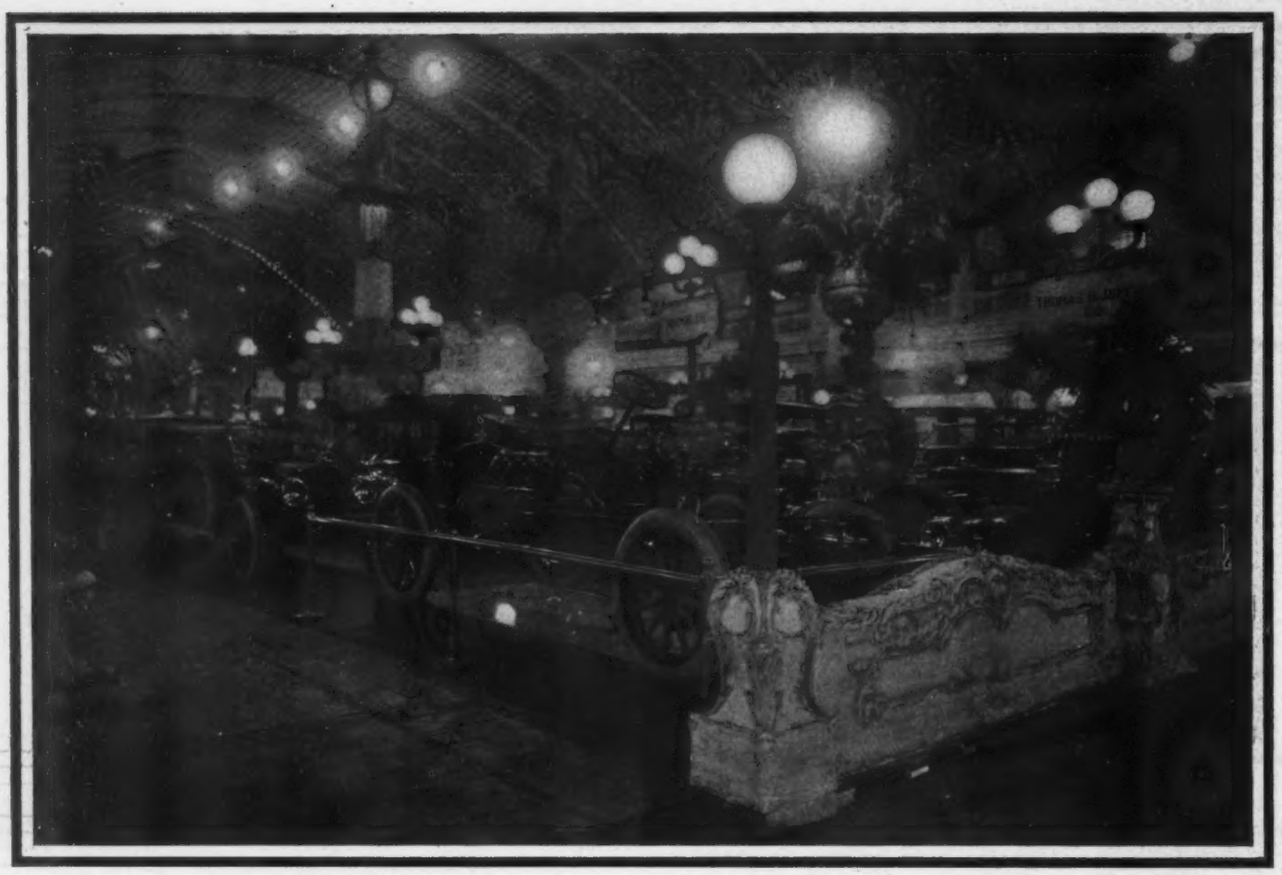
The Chalmers display had a most beautiful setting

contracting emergency brake is found on the rear wheels; folding trunk rack is fitted, and the hood and radiator are larger and of the torpedo type. Slight improvements are found in the other models in this line.

Locomobile—One change in the Locomobile four-cylinder 30 is in installing the Bosch dual high-tension ignition system. A new carbureter is used. A change in the rear axle is that the pinion shaft at the rear end of the propellor shaft has a double ball bearing in front of the pinion. The biggest feature of the 1911 line is the new six-cylinder, the motor of which in general designs follows that of the four, using the same bore and stroke. The cylinder castings are made with larger waterjacket spaces and the valves are of greater diameter than in the four. A circulating oiling system is used, the gear oil pump delivering the oil into a very small trough under each connecting rod. It uses high-tension ignition. A multiple-disc clutch is used. The same gearbox and rear axle construction as used on the four cylinder is fitted.

Lozier—Six-cylinder motor has been improved by the installation of a compressor release which holds the exhaust valve open to assist in starting. It is controlled by a handle in front of the radiator. The steering column is carried in a Hess-Bright ball bearing in the dash, which makes its movement much easier. Valve caps are now threaded into the tops of the valve cages; therefore the intake and exhaust caps for each cylinder were held by a crow-foot yoke. The valve diameter has been increased. A neat body feature of the Lakewood model is that the tonneau door on the left is hinged to the body still and swings down and out, forming an emergency seat for the chauffeur. When not in use the seat has every appearance of a door. On the four-cylinder model the leading change has been increasing the stroke from 5 1-4 to 6 inches.

Where the Glide held forth in the Coliseum Annex



THE RAMBLER, SELDOM SEEN IN THE BIG SHOWS, WAS IN EVIDENCE

Marmon—But few changes have been made in the one Marmon chassis for next year, the most important alteration being an increase in the valve diameter from 2 1-4 to 2 1-2 inches, and increasing the wheelbase from 116 to 120 inches, bringing about a trifle more power and easier riding qualities.

Matheson—Several Matheson changes have been made, one being a new coupling between the clutch and gearset, which carries a ball bearing intended to steady the rear end of the clutchshaft as well as taking the thrust of the clutch spring. This bearing is carried in a bracket on a cross-member of the frame. The universal joint construction is squared and slides in a square hole in the coupling, thus providing a slip joint. A universal type of coupling has also been fitted in the pump shaft. A V-cross section design of fan belt is added. On the four-cylinder Matheson, which heretofore has used low-tension ignition exclusively, an option of a high-tension Bosch system is offered. The drive chains on this model are encased.

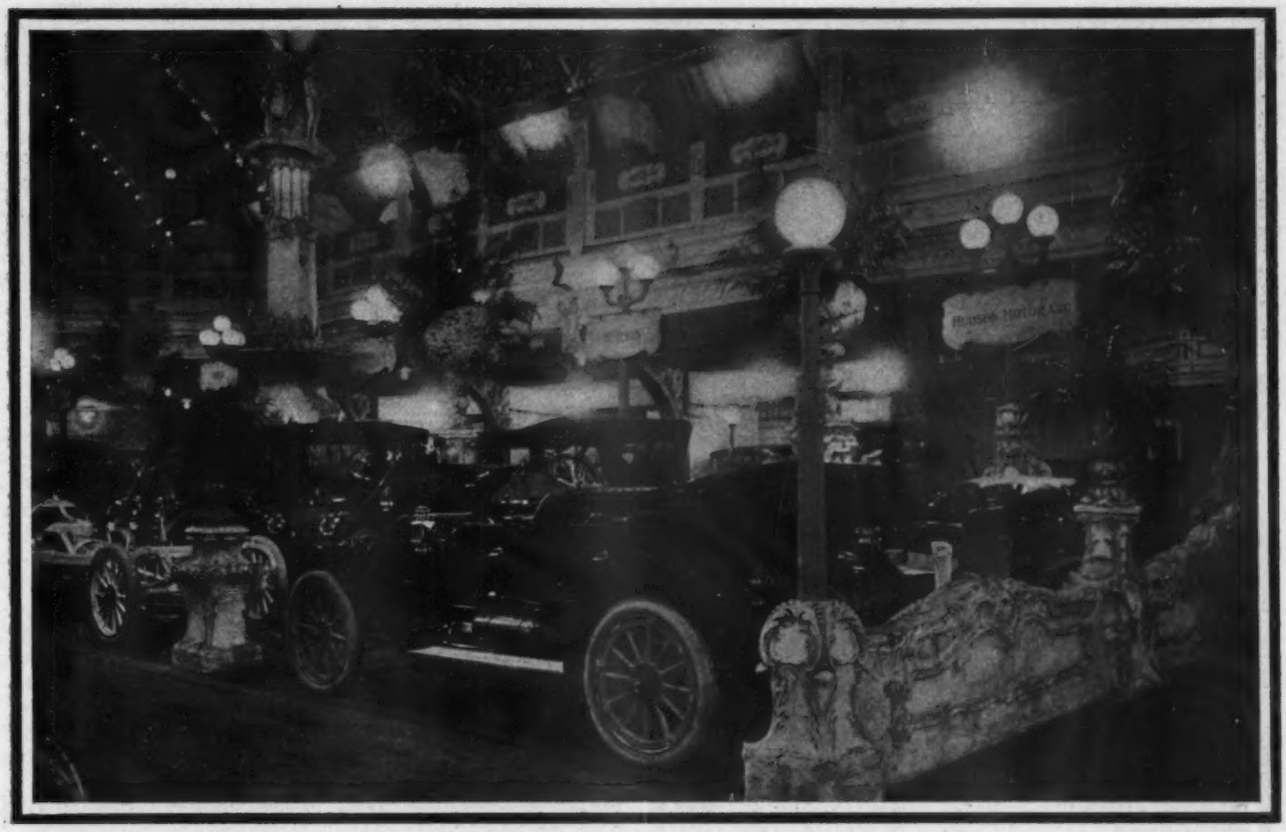
Maxwell—The four Maxwell chassis for this year will accommodate thirteen different types of bodies. The Maxwell features—unit type of construction, three-point suspension, thermo-syphon cooling and multiple-disc clutch—are retained and in addition all models are equipped with magnetos. The two-cylinder Maxwell, which long has been one of the concern's standbys, is retained. The body styles offered by the Maxwell include open front and fore-door touring effects, straight line torpedo, close coupled and light touring styles, surreys, runabouts with single rumble seats, runabouts with flat deck and tool box in the rear and torpedo roadster.

McIntyre—Improvements in the McIntyre pleasure cars have brought about the use of heavier axles throughout and the adoption of a long-stroke motor. New metal body designs have been adopted and a magneto is used. All the models are equipped with new springs, three-quarter platforms being used in the rear. The McIntyre motor is a four-cylinder proposition, with the cylinders cast singly but bolted together, giving an en-bloc effect.

Middleby—Both water and air-cooled motors are used in making up the Middleby line for 1911. The company is located at Reading, Pa., and the output is conservatively limited. The water-cooled type is an innovation for this concern. The motors are of various sizes and body styles.

Midland—But few changes are to be found in the Midland line for 1911. Model L2 is an evolution of the 1910 model L with the same specifications as model L1 except that it is equipped with a fore-door body. All cars have the Midland unit power plant of 40-horsepower. They are equipped with the Rayfield carbureter, Splitdorf magneto, an oil-feed indicator and new style foot accelerator pedals in a divided footboard, all of which are changes or additions made for 1911.

Mitchell—In the water system, hose connections are now used, taking the place of castings. The oil filler for the circulating oiling system is now accessibly located on the right front motor arm. The exhaust valve cages are held in place by a threaded ring instead of by the yoke-and-bolt method. The four-cylinder models are now manufactured with a circulating oiling system. A plunger pump actuated from the camshaft circulates the oil. The overflow standpipes in the crankcase compartments are adjustable from the outside. The fan is now a one-piece aluminum stamping. Between the magneto and water pump is a new coupling, which allows of correcting the magneto timing without removing the magneto. The crankshaft on all models has been increased in diameter from 1 7-8 to 2 inches. The brakes are now 16 inches.



THE DISPLAY OF THE HUDSON 1911 LINE WAS QUITE COMPREHENSIVE

Moline—The most important change here is the lengthening of the stroke from 4 1-2 to 6 inches. Two independent ignition systems are fitted, one a magneto, the other a battery with distributer on a short vertical shaft at the front of the crankcase. The wheelbase has been increased from 112 to 117 inches. A lower body carriage is obtained by dropping the frame side members 2 1-2 inches in front of the rear axle. These side members are now offset at the dash. The frame stock is now 3-16-inch. Rear brake drums are now 13 1-2 and 14 inches. The bearings in the front wheels are heavier; they are of the cup-and-cone type, with 5-8 and 3-4-inch balls; they used to be 1-2 and 5-8-inch ball sizes. Nickel steel is used in the gears and shafts of the gearset, pinion and bevel in the rear axle.

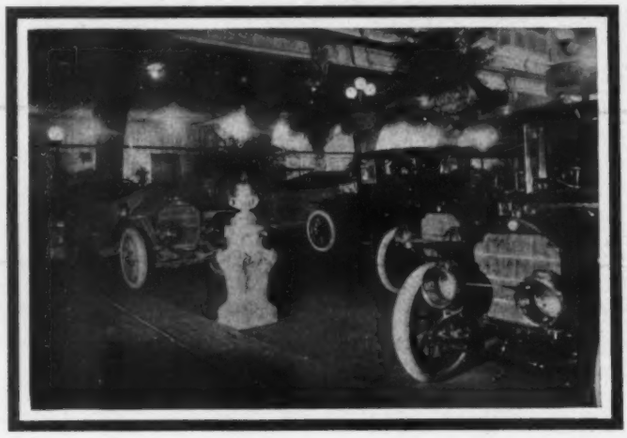
Moon—On the Moon model 30 the motor weight has been reduced 72 pounds, and the horsepower increased by changing the valve opening from 1 7-8 to 2 inches and increasing the valve lift 1-16 inch. Rollers on the lower ends of the valve lifters have taken the place of the mushroom ending. Instead of spur gears used in the engine to drive the camshaft, helical ones are fitted. A multiple-disc clutch has superceded the band type. An improved worm-and-gear type of steering gear has taken the place of the gear-and-sector design of last year. The wheelbase has been increased 4 inches and this extra space utilized in the tonneau. The model 45 motor has been simplified in the matter of magneto and water pump drive. These are carried on a transverse shaft at the front of the motor. The mechanical oiler has been taken off the dash.

National—Replenishing the motor oil supply is facilitated by a filler pipe with spring-retained cover. Carbureter adjustment is made easy in that the eccentrics for changing the needle valve are to the outside instead of the inside. The installing of a float within an oil well in the crankcase and carrying an indicator at the left rear corner of the motor afford indiction of the oil level. The fender construction has been strengthened in front and rear, the bracket being a Y type. The gearbox is now hung so that it can be dropped from the chassis without removing the body. In the intake manifold, the auxiliary air controllor from the steering column is a poppet type of valve instead of a sliding design. Each cylinder head now carries an aluminum cover plate. The cams in the motor have been made larger.

Ohio—The leading mechanical change in the Ohio models is the fitting of improved front and rear axles, the former being an I-beam type with extra large end yokes and ball thrust bearings at the top of the yoke and mounted on tapered rollers. The rear axle is a floating design with a pressed steel housing, with annular bearings carrying the differential and wheels. The company has dispensed with the torque tube, which in 1910 enclosed the propellershaft, and has in place fitted a propellershaft with two universal joints. A triangular torsion rod parallels the propellershaft. A line of torpedo bodies with inside control has been added.

Oldsmobile—L-head design has given way to T-type cylinders, and dimensions are increased from 4 3-4 inches square to 5-inch bore and 6-inch stroke, and the valves have been enlarged from 1 3-4 to 2 3-4 inches. The engine gearcase is an integral part of the motor crankcase, and lubrication of the engine gears is by means of oil admitted through an internal lead from the main engine supply. A new carbureter is fitted to the motor to give a wider range of adjustment, and the intake and exhaust manifolds are exceptionally large. Bosch dual ignition is employed. The flywheel and clutch cone are larger in diameter and thermoid facing is used instead of leather. A universal joint of the sliding block and yoke type is replaced by a plain double universal of heavy construction. The driveshaft is inclosed in a torsion tube.

The Columbia exhibit was staged in effective surroundings



The Stoddard-Dayton line was one of the largest in the Coliseum

Otto—In the Otto, the Philadelphia-made car, there has been substituted a full floating rear axle in place of the live type one used last year. The spokes in the rear wheels have been bossed, while larger brake drums are used. There is a universal case to the housing and the differential are one-piece and of manganese bronze. The old motor is retained and the two chassis are represented in nine different models.

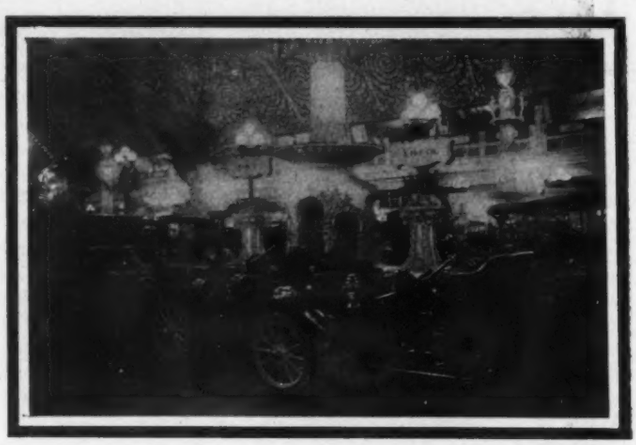
Overland—Four new chassis models are among the Overlands. The intake gas manifold of the motor is simplified in design and carbureter equipment is optional. A distributing reservoir is located at the top rear side of the radiator. There is also a change in the radiator design, in that the top is now a semi-circular instead of semi-hexagonal with rounded corners. In the clutch the large single clutch spring is replaced by three adjustable outside springs located on the clutch spokes. The gearset cases have been reinforced. As for the changes in the new models over the old ones, there is a slight difference in cylinder dimensions, making the motors larger and more powerful; double ignition systems are fitted with a Bosch magneto; there are screens on the front of the radiator to give a honeycomb effect.

Packard—On the "18" and "30" models the high-tension wires from the magneto distributer to the plugs are now encased in a metal tube which rises between the cylinder pairs and crosses to the side on which the spark plugs are located. The primary air intake pipe on the carbureter has been extended and now rises vertically to a point slightly higher than the top of the auxiliary air valve. An improvement on the rear springs is the addition of three short leaves in the base of the spring, which leaves are of greater radius than that of the leaves constituting the spring proper. All touring cars are standard with fore-door bodies. In limousines the dome light is in the rear of the ceiling, thereby enabling the passengers to read with comfort.

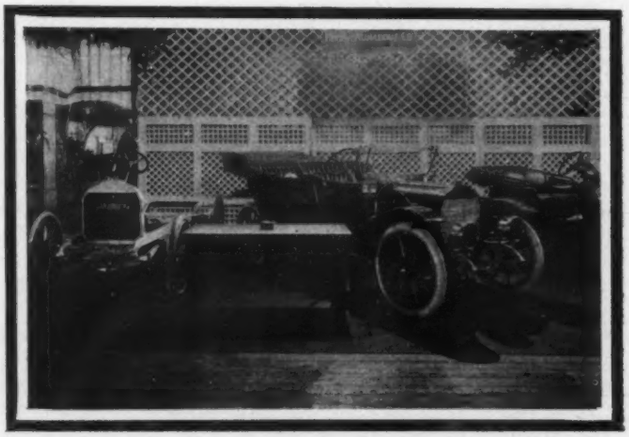
Peerless—In these cars the motors are increased from 4 7-8 by 5 1-2 to 5 by 5 1-2, and valves have narrower seats of a less acute angle, so that the liability of carbonization of the valve seats is reduced. The ball bearing previously used on the forward end of the crankshaft is replaced by a plain bearing to increase rigidity of crankshaft, the crankcase is of heavier construction, the external leads to the cylinders have been eliminated from the oiling system, all internal motor mechanisms except the front engine gears being oiled by splash, and the five sight feeds on the dash have been reduced to two. Carburetion is improved by adding a spring attachment to the auxiliary air valve, and starting of the motor is greatly facilitated by a priming device operated from the front end of the car.

Pierce-Arrow—All motors are fitted with Pierce-made power air tire-pump. An accelerator pedal has been fitted. A priming system is fitted to the motor whereby gasoline can, by a pump on the dash, be sprayed into the intake manifold to facilitate starting. Approximately one tablespoonful is injected. The hood has not to be raised to do the priming. The clutch facing on the cone is German bronze, which has taken the place of leather. Fabric heretofore used on the brake shoe faces has been replaced by German bronze. The brake diameters on all models have been increased. Two of the motor sizes have been enlarged as follows: Six-36 is 4 by 5 1-8 inches; it was 4 by 4 3-4. Six-48 is 4 1-2 by 5 1-2; it was 4 1-2 by 4 3-4. On the left running board an extension has been made to the battery box, forming a compartment for light tools and an oil can.

Pope-Hartford—Cylinder dimensions are changed from 4 5-16 by 5 1-8 to 4 3-4 by 5 1-2. Valves are larger, compression grease



E-M-F and Flanders cars combined to form a pretty exhibit

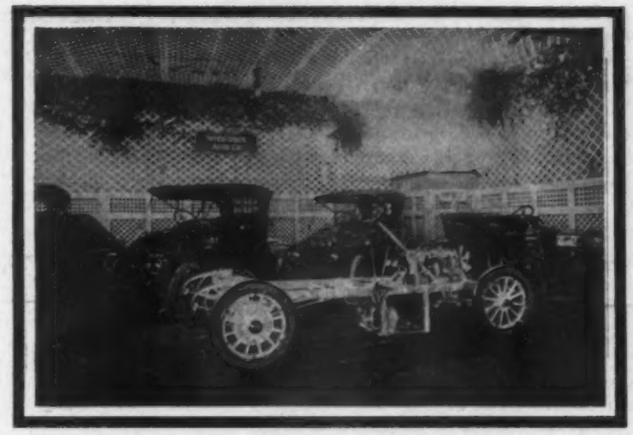


The 1911 Sampson touring car and chassis were shown

cups are fitted to the rocker arm bearings, ball joints are provided at the upper ends of the push rods and the rocker arms are of heavier construction. Ignition is by means of an improved Bosch dual system, with a combination coil and switch passing through the dash, and the cylinders are tapped for two sets of plugs, so that double igntion may be used if desired. The magneto is now at the right front end of the motor and driven off a transverse shaft and worm gears from the shaft on the left side of the motor that drives the water pump and mechanical oiler. The carbureter is also shifted to the right side; a foot accelerator is added, the exhaust and intake piping is changed about and the whole rearrangement makes for greater accessibility.

Premier—Among the changes to be found on Premier cars the replacement of the simple splash lubrication system in the motor by a circulating system is one of the most important. A gear oil pump situated at the right rear corner of the crankcase and gear, driven off the camshaft, forces oil through a large main pipe arranged along the outside of the case at the right to troughs into which the connecting rod scoops dip. In the cooling system the fan is reversed, the fan bracket being turned around so that the fan is now closer to the cylinders than the radiator, enlarging its scope of action. The fan belt pulley is just behind the radiator and is now driven off a pulley on the front end of the magneto and water pump shaft instead of at the rear of the engine gear housing.

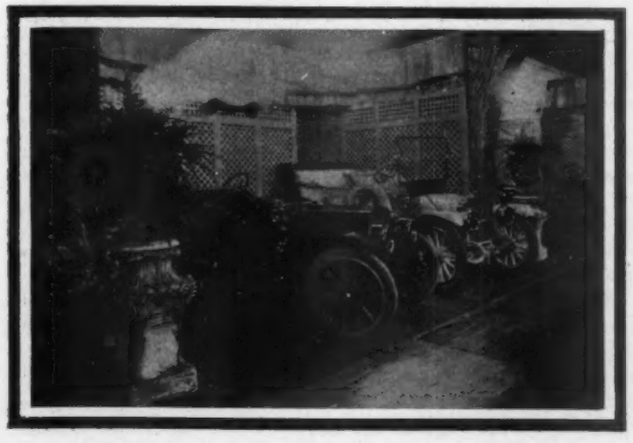
Pullman—The Pullman Motor Car Company is a pioneer in that it advocates the use of a continuous waterjacket for a four-cylinder motor. By the use of this continuous waterjacket construction there is a common water space from the rear to the front cylinders and the water piping is limited to the intake and exhaust pipes. A water pump is used for maintaining the circulation, and in addition there is a belt-driven fan located between the front cylinder and the radiator. In casting these cylinders the Pullman company leaves large openings so gases can escape, and there is no danger of destroying the castings. In spite of the short space occupied by the motor, the design permits of the use of five crankshaft bearings. Little change has been made in the Pullman bodies, except to give a little more leg room by adding 2 inches to the wheelbase.



Inter-State cars were given effective representation in the Annex

The Knox display in the Coliseum was complete in every detail

The big Reo display was a constant attraction



Gives an idea of the pretty surroundings of the Corbin exhibit

Rambler—The 1911 offerings of this line include two sizes of motors of the four-cylinder, four-cycle type. The smaller is 4 1-2 by 4 1-2 in its cylinder measurements and is rated at 32.4 horsepower under the A. L. A. M. formula. The larger motor is 5 by 5 1-2 inches—a 40-horsepower rating. The cylinders are cast separately; cooling is by centrifugal pump and Rambler radiator; high-tension magneto with storage battery auxiliary; mechanical oiler; multiple-disc clutch; three-speed selective transmission, and shaft drive are a few of the chief characteristics. The wheelbase ranges from 112 to 128 inches.

Reo—Timken roller bearings have replaced ball bearings in front wheels, supporting differential and carrying the propeller-shaft within the torsion tube. At the outer ends of the rear axle are Hyatt high-duty bearings. An accelerator has been added. Between the clutch and gear-box is a new coupling. By the removal of two bolts, the clutch can be removed without disturbing the gearbox, and vice versa. The flywheel has been made heavier and of greater thickness. By adding four more plates to the multiple-disc clutch the number has been brought to twenty-four. Instead of one central clutch spring there are three regularly disposed around the flywheel face. One of the latest body types is a two-passenger torpedo using the standard chassis,

except that it uses 32 by 3 1-2 inch tires instead of 34 by 3 1-2 inch sizes.

Royal Tourist—The double ignition system, with a double set of plugs, is now replaced by a Bosch dual ignition system. The plunger pump is replaced by a gear pump situated on the right side of the motor near the rear. In the new oiling system oil is forced through a filter located in the left rear leg of the motor and then up through sight feeds on the dash. The carbureter is provided with a tubular by-pass communicating between the float chamber and the mixing chamber just above the butterfly valve, and when the throttle is closed a strong spray of almost pure fuel is sucked into the cylinders to prime them. The radius rods have a free bearing on the rear axle and are integral with the inside plates that support the brake shoes.

Schacht—This is the first year for the four-cylinder Schacht, made by the Cincinnati concern, which entered the motor industry originally with a motor buggy. The company carries over its two-cylinder model, which has been refined and improved in detail. The four-cylinder proposition has a bore of 4 5-16 inches and a 5-inch stroke, and the 2-inch valves are placed at the side. The clutch is a cone, and splash lubrication is employed, operated by a plunger pump. Magneto ignition is utilized and the wheelbase is 120 inches on the touring car and 110 on the roadster. The rear axle is semi-floating and the front an I-beam section single-piece drop forging.

Selden—The most important Selden detail for this year is the addition of a new model on which three fore-door body types are fitted. This chassis differs from previous Selden types in that the side members of the frame heretofore straight from end to end are now narrowed at the dash and raised above the rear axle. Three-quarter elliptic springs have taken the place of the semi-elliptic types in the rear. The wheelbase has been increased from 116 to 125 inches. Two universal joints are used in the propeller shaft, which is now paralleled by a torsion rod. The timer and oil pump are now located at the center of the motor and the timer is elevated, being mounted on a pedestal on the crankcase.

Speedwell—A cast aluminum dash is fitted and carries the circular end of the Bosch coil and a vertical glass tube oil sight feed. A new coupling has been inserted in the magneto shaft. Where the shaft is split on one end is a disc with eight holes, and on the other end a disc with ten holes. These discs are bolted together and the combination between the eight and ten holes gives every desired accuracy. The ball-and-socket connections in the spark and throttle controls on the motor are now adjustable to take up wear. The front end of the frame has been reinforced by heavy gusset plates. Rear springs are flatter, giving the entire body a 3-4-inch lower carriage. The springs are now of vanadium steel. All models are fitted with Firestone demountable rims. The 1911 Timken rear axle is used.

Staver-Chicago—These cars are shown in three sizes of four-cylinder motors; 4 by 4, 4 3-8 by 5 and 4 1-2 by 5 inches. The cylinders of the small motor are cast in pairs, while the others are of the block type. A wide choice of body designs is offered, ranging from the open roadster to limousine, and including several of the prevailing fore-door types. Low tension magneto and dry batteries supply the ignition. The 1911 wheelbases range from 112 to 124 inches, varying with the chassis type.

Stearns—In Stearns models some changes in conveniences have been made. The Bosch cylindrical coil is used, being carried horizontally in the dash with its switch end flush with the dash face. The air pump for maintaining air pressure on the gasoline has been taken off the dash and is now carried on the floorboard between the two front seats. The small gasoline tank on the dash, from which the gasoline feeds by gravity to the carbureter, has been improved with a new float valve and pressure regulator. Another brace has been added to the right running board to reinforce it and give it adequate strength to carry the demountable rims, which have been made stock on all models. The auxiliary oil tank, in which a supply is carried to replenish the crankcase, has been located on the floorboards at the right.

Stevens-Duryea—Few changes have been made in Stevens-Duryea cars, the company marketing three models, two six-cylinder types and one four-cylinder, all cast in pairs. Each motor has a different cylinder size as follows: 4 1-4 by 4 1-2, six-cylinder; 4 1-4 by 4 3-4, six-cylinder; and 4 3-4 by 4 1-2, four-cylinder. A great variety of body styles are shown with this line. The prevailing fore-door type of touring cars and roadsters and the usual closed bodies are featured.

Stoddard-Dayton—Motor appearance is improved by enclosing within the tappet guides the springs that were outside of these rods. The water pipes are metal instead of hose lengths. The fan has been provided with an eccentric adjustment. The size of the pump shaft has been doubled. A double ignition system is fitted, consisting of a Bosch magneto and a secondary set with battery and combined timer distributer. An improvement in the gearbox is the fitting of ball bearings for both shafts. Changing the front axle contour has lowered the body frame at this point. A ball and thrust bearing has been fitted in the steering gear; brake drums are increased in diameter and width; demountable rims are standard. On the Stoddard 30 an entirely new L-type motor is used. It has a circulating oiling system. On the Stoddard 20 a monobloc motor is used.

Studebaker—This line consists of three chassis types, the smaller of which has a four-cylinder, four-cycle motor 4 by 3 3-4. The next larger size is 4 1-4 by 5 1-4 inches, rated at 28.9 horsepower and the largest is 4 3-4 by 5 1-4 inches, 36.1 horsepower under A. L. A. M. rating. Various body types are fitted to these chassis. The use of friction transmission in several of the styles is one feature. Low tension ignition and storage batteries are used in all models. The wheelbase of the big car is 140 inches.

Thomas—Few changes are to be found in Thomas cars. In the model M the diameter of the valves is increased from 2 1-8 to 2 5-16 inches. The crankcase is now divided horizontally, so that the lower portion can be dropped as the crankshaft is supported in the upper section. This is a radical change from the barrel-type crankcase previously employed. In the cooling system the fan belt is now driven off a pulley on the crankshaft instead of off a pulley on the front end of the magneto gearshaft. A hand compression oil can has been provided. Tire sizes have been increased on the rear from 36 by 4 to 37 by 5. The body is larger and more roomy, more elaborately equipped. The model K remains unchanged except that Continental demountable rims are a part of the regular equipment.

Welch-Detroit—This car is made in one model with a four-cylinder motor of the vertical type, the A. L. A. M. rating of which is 40 horsepower. The bore is 5 inches and the stroke 5 inches also. The cylinders are cast in pairs, and the valves are situated on opposite sides. The lubrication is effected by means of a circulating pump and the cooling by a centrifugal pump and tubular radiator. The gasoline is fed by gravity to a Schebler carbureter and the ignition is supplied by magneto and supplementary coil. The power from the motor is transmitted through a leather-cone clutch to a three-speed selective type transmission, located amidships, and the final drive to the road wheels is by a live rear axle. The service brake is of the external contracting type and the emergency brake of the internal expanding type. The front axle is an I-beam drop forging and the springs of the semi-elliptic type. The wheelbase is 122 inches and the tread standard. Ball bearings are used throughout, with the exception of the crankshaft which has plain bearings. Front tires are 36 by 4, and rear 36 by 4 1-2. This car is being shown at the Buick branch, 1452 Michigan avenue, Chicago.

Westcott—This powerful car is offered in two chassis sizes, the motors of which are 4 1-2 by 5 and 4 3-4 by 5 inches and fitted with a variety of body styles. These are for four, five or seven passengers and represent modern ideas of construction. The Westcott cylinders are singly cast and the motor is cooled by centrifugal pump and honeycomb radiator. Ignition is by high-tension magneto and dry cells; lubrication,

splash; cone clutch, and the wheelbases are 112 and 120 inches. Tire equipment is 36 by 4 inches all around.

Winton—On the motor, brass tubing has replaced aluminum castings for the water and also the intake manifolds. A cellular radiator has taken the place of the vertical-tube type. A Stromberg carbureter is now stock. The magneto is driven from a continuation of the pump shaft, in which continuation is a jaw coupling. A leading change in the running gear is the substitution of an I-beam front axle in place of the pressed steel type used last year. The side frame members are now dropped 2 1-2 inches in front of the rear axle. The radius rods have been improved and are now made with a ball-and-socket support at either end. Brake drums, which were 12 by 2 1-2 inches, have been increased to 14 by 3 inches. Tires are now 36 inches in diameter.

White—The White leader is a 40-horsepower touring car, which is practically a duplicate of the 30-horsepower model brought out in 1910 except that it is larger. The leading characteristics of the motor are its simple en-bloc L-type cylinder construction, mounted on an aluminum crankcase having three-point suspension. The long-stroke principle is retained. Lubrication is by means of a plunger pump. Ignition is by means of a single high-tension magneto. Power is transmitted from the motor through a leather-faced cone clutch, a selective gearset having four forward speeds and reverse direct drive on the third speed, a propeller shaft with two universal joints and a semi-floating rear axle equipped with annular ball bearings. The tire dimensions are 36 by 4 inches and 36 by 4 1-2 inches. The wheel-base is 120 inches.

Zimmerman—Both two-cylinder and four-cylinder models are shown under this heading. The Z-40 type is one of the four-cycle, four-cylinder styles. This car seats five passengers and is fitted with foredoor touring body. The wheelbase is 115 inches. The cylinders, cast in pairs, are 4 5-16 by 5 inches and are cooled by thermo-syphon system. Low-tension ignition is used. The lubrication system is based on a mechanical oiler. The clutch is of the cone type; transmission is of the three-speed selective type, and shaft drive is used. The tires are 34 by 3 1-2 inches.

Among the Electrics.

The display of electric pleasure cars at the National show is quite extensive, including the following makes: Woods, Baker, Babcock, Waverley, Detroit, Rauch & Lang, Hupp-Yeats, Ohio and Broc.

Babcock—Roadster and coupé types; prices, $2,400 and $2,600, respectively. Batteries, 42 and 36 cells, divided. Chain drive; wheelbases, 94 and 86 inches; tires, 34 by 4 and 32 by 4 inches.

Baker—Victoria and Runabout, priced at $2,000. Shaft drive; wheelbase, 80 inches; pressed steel frame; tires, 32 by 3 1-2 inches.

Broc—The Broc line consists of coupés and open bodies for two, three, four or five persons. Chain drive; 32-inch wheels, and wheelbases of from 80 to 83 inches are some of the features of the cars.

Detroit—Body optional. Edison 9-6 battery; chain drive; wheelbase, 85 inches; pressed steel frame; tires, 34 by 4 and 32 by 4 inches.

Ohio—Four and five-passenger coupés and victorias. Prices, $2,300, $2,600 and $2,700 (the first being for the victoria). Exide batteries; shaft drive; wheelbase, 81 inches; tires, 34 by 4 inches.

Hupp-Yeats—Motor Westinghouse V; controller Westinghouse constant contact type; Exide battery; pressed steel, low hung frame; internal brakes; price, $1,750; f. o. b. Detroit.

Rauch & Lang—Both open and closed bodies are shown in several styles in the 1911 line of this company. A victoria to carry four passengers has chain drive; 40-cell battery; wheelbase 86 inches, and wheels 34.

Woods—Two chassis and numerous body designs are among the Woods offerings. Model 1012 has wheelbase, 86 inches, solid tires, 30 by 2 1-2 in front, 34 by 2 1-2 rear; expanding metal to metal brakes; special Woods motor; 4-pole series wound; five passengers; price, $2,900, with brougham body.

Waverley—This line is quite extensive, including all the standard bodies and a few beside. Model 69, runabout, has wheelbase 72 inches; Exide, Waverley or National batteries; motor, Waverley; price, $1,150, without top.

Many Western and Local Commercials

THE SECOND SECTION OF THE CHICAGO SHOW WILL HAVE A LARGE REPRESENTATION OF WESTERN BUILDS THAT HAVE NOT AS YET PENETRATED THE EASTERN TERRITORY

CHICAGO, Jan. 30—Practice, as it related to animal transportation, however fine it appeared, is looked upon as wanting in some particulars from the freight automobile point of view. According to the ways of the near-past, the automobile was used for long hauls and the horse was pressed into service for short haul work.

This must be regarded as an admission on the part of the advocates of the horse that he is a makeshift commercial proposition, one, in fine, that is only to be regarded as possible if a merchant has horses to use and considers it necessary to get some service out of them while they remain in fettle, knowing full well that the time is near at hand when it will be necessary to displace them with freight automobiles.

Of the several systems now being tried out, there is one that was handed down from the time when horse-drawn vehicles were used exclusively, *i.e.*, delivery by trucks to distributing points, with large storage houses at the points and after unloading the merchandise and storing it over night it was transferred to delivery with wagons drawn by horses and the short hauls were made; in other words, the goods were delivered. This plan is not only disastrous, due to the cost of maintaining storage buildings, but the delay incidental was always a source of great dissatisfaction to customers who want goods the day they are ordered.

In order to retain the advantages of the system it is now proposed to make the primary delivery by means of large automobile trucks, and to store the goods on the platforms of these trucks in large baskets or other convenient packages and by having the goods properly classified, to provide for their quick transfer for each route to the delivery wagon of that route.

This plan is not different from that in vogue in the United States mail service, in which mail bags are used to hold the mail as it is being sorted out during primary transportation, and when a mail car comes to a delivery point all that the man in charge has to do is to transfer the bags for that route to a delivery wagon which is held in waiting there for this express purpose. There is little or no delay attending the delivery of mail, as it will be readily appreciated. The mail method provided for

except that it uses 32 by 3 1-2 inch tires instead of 34 by 3 1-2 inch sizes.

Royal Tourist—The double ignition system, with a double set of plugs, is now replaced by a Bosch dual ignition system. The plunger pump is replaced by a gear pump situated on the right side of the motor near the rear. In the new oiling system oil is forced through a filter located in the left rear leg of the motor and then up through sight feeds on the dash. The carbureter is provided with a tubular by-pass communicating between the float chamber and the mixing chamber just above the butterfly valve, and when the throttle is closed a strong spray of almost pure fuel is sucked into the cylinders to prime them. The radius rods have a free bearing on the rear axle and are integral with the inside plates that support the brake shoes.

Schacht—This is the first year for the four-cylinder Schacht, made by the Cincinnati concern, which entered the motor industry originally with a motor buggy. The company carries over its two-cylinder model, which has been refined and improved in detail. The four-cylinder proposition has a bore of 4 5-16 inches and a 5-inch stroke, and the 2-inch valves are placed at the side. The clutch is a cone, and splash lubrication is employed, operated by a plunger pump. Magneto ignition is utilized and the wheelbase is 120 inches on the touring car and 110 on the roadster. The rear axle is semi-floating and the front an I-beam section single-piece drop forging.

Selden—The most important Selden detail for this year is the addition of a new model on which three fore-door body types are fitted. This chassis differs from previous Selden types in that the side members of the frame heretofore straight from end to end are now narrowed at the dash and raised above the rear axle. Three-quarter elliptic springs have taken the place of the semi-elliptic types in the rear. The wheelbase has been increased from 116 to 125 inches. Two universal joints are used in the propeller shaft, which is now paralleled by a torsion rod. The timer and oil pump are now located at the center of the motor and the timer is elevated, being mounted on a pedestal on the crankcase.

Speedwell—A cast aluminum dash is fitted and carries the circular end of the Bosch coil and a vertical glass tube oil sight feed. A new coupling has been inserted in the magneto shaft. Where the shaft is split on one end is a disc with eight holes, and on the other end a disc with ten holes. These discs are bolted together and the combination between the eight and ten holes gives every desired accuracy. The ball-and-socket connections in the spark and throttle controls on the motor are now adjustable to take up wear. The front end of the frame has been reinforced by heavy gusset plates. Rear springs are flatter, giving the entire body a 3-4-inch lower carriage. The springs are now of vanadium steel. All models are fitted with Firestone demountable rims. The 1911 Timken rear axle is used.

Staver-Chicago—These cars are shown in three sizes of four-cylinder motors; 4 by 4, 4 3-8 by 5 and 4 1-2 by 5 inches. The cylinders of the small motor are cast in pairs, while the others are of the block type. A wide choice of body designs is offered, ranging from the open roadster to limousine, and including several of the prevailing fore-door types. Low tension magneto and dry batteries supply the ignition. The 1911 wheelbases range from 112 to 124 inches, varying with the chassis type.

Stearns—In Stearns models some changes in conveniences have been made. The Bosch cylindrical coil is used, being carried horizontally in the dash with its switch end flush with the dash face. The air pump for maintaining air pressure on the gasoline has been taken off the dash and is now carried on the floorboard between the two front seats. The small gasoline tank on the dash, from which the gasoline feeds by gravity to the carbureter, has been improved with a new float valve and pressure regulator. Another brace has been added to the right running board to reinforce it and give it adequate strength to carry the demountable rims, which have been made stock on all models. The auxiliary oil tank, in which a supply is carried to replenish the crankcase, has been located on the floorboards at the right.

Stevens-Duryea—Few changes have been made in Stevens-Duryea cars, the company marketing three models, two six-cylinder types and one four-cylinder, all cast in pairs. Each motor has a different cylinder size as follows: 4 1-4 by 4 1-2, six-cylinder; 4 1-4 by 4 3-4, six-cylinder; and 4 3-4 by 4 1-2, four-cylinder. A great variety of body styles are shown with this line. The prevailing fore-door type of touring cars and roadsters and the usual closed bodies are featured.

Stoddard-Dayton—Motor appearance is improved by enclosing within the tappet guides the springs that were outside of these rods. The water pipes are metal instead of hose lengths. The fan has been provided with an eccentric adjustment. The size of the pump shaft has been doubled. A double ignition system is fitted, consisting of a Bosch magneto and a secondary set with battery and combined timer distributer. An improvement in the gearbox is the fitting of ball bearings for both shafts. Changing the front axle contour has lowered the body frame at this point. A ball and thrust bearing has been fitted in the steering gear; brake drums are increased in diameter and width; demountable rims are standard. On the Stoddard 30 an entirely new L-type motor is used. It has a circulating oiling system. On the Stoddard 20 a monobloc motor is used.

Studebaker—This line consists of three chassis types, the smaller of which has a four-cylinder, four-cycle motor 4 by 3 3-4. The next larger size is 4 1-4 by 5 1-4 inches, rated at 28.9 horsepower and the largest is 4 3-4 by 5 1-4 inches, 36.1 horsepower under A. L. A. M. rating. Various body types are fitted to these chassis. The use of friction transmission in several of the styles is one feature. Low tension ignition and storage batteries are used in all models. The wheelbase of the big car is 140 inches.

Thomas—Few changes are to be found in Thomas cars. In the model M the diameter of the valves is increased from 2 1-8 to 2 5-16 inches. The crankcase is now divided horizontally, so that the lower portion can be dropped as the crankshaft is supported in the upper section. This is a radical change from the barrel-type crankcase previously employed. In the cooling system the fan belt is now driven off a pulley on the crankshaft instead of off a pulley on the front end of the magneto gearshaft. A hand compression oil can has been provided. Tire sizes have been increased on the rear from 36 by 4 to 37 by 5. The body is larger and more roomy, more elaborately equipped. The model K remains unchanged except that Continental demountable rims are a part of the regular equipment.

Welch-Detroit—This car is made in one model with a four-cylinder motor of the vertical type, the A. L. A. M. rating of which is 40 horsepower. The bore is 5 inches and the stroke 5 inches also. The cylinders are cast in pairs, and the valves are situated on opposite sides. The lubrication is effected by means of a circulating pump and the cooling by a centrifugal pump and tubular radiator. The gasoline is fed by gravity to a Schebler carbureter and the ignition is supplied by magneto and supplementary coil. The power from the motor is transmitted through a leather-cone clutch to a three-speed selective type transmission, located amidships, and the final drive to the road wheels is by a live rear axle. The service brake is of the external contracting type and the emergency brake of the internal expanding type. The front axle is an I-beam drop forging and the springs of the semi-elliptic type. The wheelbase is 122 inches and the tread standard. Ball bearings are used throughout, with the exception of the crankshaft which has plain bearings. Front tires are 36 by 4, and rear 36 by 4 1-2. This car is being shown at the Buick branch, 1452 Michigan avenue, Chicago.

Westcott—This powerful car is offered in two chassis sizes, the motors of which are 4 1-2 by 5 and 4 3-4 by 5 inches and fitted with a variety of body styles. These are for four, five or seven passengers and represent modern ideas of construction. The Westcott cylinders are singly cast and the motor is cooled by centrifugal pump and honeycomb radiator. Ignition is by high-tension magneto and dry cells; lubrication,

splash; cone clutch, and the wheelbases are 112 and 120 inches. Tire equipment is 36 by 4 inches all around.

Winton—On the motor, brass tubing has replaced aluminum castings for the water and also the intake manifolds. A cellular radiator has taken the place of the vertical-tube type. A Stromberg carbureter is now stock. The magneto is driven from a continuation of the pump shaft, in which continuation is a jaw coupling. A leading change in the running gear is the substitution of an I-beam front axle in place of the pressed steel type used last year. The side frame members are now dropped 2 1-2 inches in front of the rear axle. The radius rods have been improved and are now made with a ball-and-socket support at either end. Brake drums, which were 12 by 2 1-2 inches, have been increased to 14 by 3 inches. Tires are now 36 inches in diameter.

White—The White leader is a 40-horsepower touring car, which is practically a duplicate of the 30-horsepower model brought out in 1910 except that it is larger. The leading characteristics of the motor are its simple en-bloc L-type cylinder construction, mounted on an aluminum crankcase having three-point suspension. The long-stroke principle is retained. Lubrication is by means of a plunger pump. Ignition is by means of a single high-tension magneto. Power is transmitted from the motor through a leather-faced cone clutch, a selective gearset having four forward speeds and reverse direct drive on the third speed, a propeller shaft with two universal joints and a semi-floating rear axle equipped with annular ball bearings. The tire dimensions are 36 by 4 inches and 36 by 4 1-2 inches. The wheel-base is 120 inches.

Zimmerman—Both two-cylinder and four-cylinder models are shown under this heading. The Z-40 type is one of the four-cycle, four-cylinder styles. This car seats five passengers and is fitted with foredoor touring body. The wheelbase is 115 inches. The cylinders, cast in pairs, are 4 5-16 by 5 inches and are cooled by thermo-syphon system. Low-tension ignition is used. The lubrication system is based on a mechanical oiler. The clutch is of the cone type; transmission is of the three-speed selective type, and shaft drive is used. The tires are 34 by 3 1-2 inches.

Among the Electrics.

The display of electric pleasure cars at the National show is quite extensive, including the following makes: Woods, Baker, Babcock, Waverley, Detroit, Rauch & Lang, Hupp-Yeats, Ohio and Broc.

Babcock—Roadster and coupé types; prices, $2,400 and $2,600, respectively. Batteries, 42 and 36 cells, divided. Chain drive; wheelbases, 94 and 86 inches; tires, 34 by 4 and 32 by 4 inches.

Baker—Victoria and Runabout, priced at $2,000. Shaft drive; wheelbase, 80 inches; pressed steel frame; tires, 32 by 3 1-2 inches.

Broc—The Broc line consists of coupés and open bodies for two, three, four or five persons. Chain drive; 32-inch wheels, and wheelbases of from 80 to 83 inches are some of the features of the cars.

Detroit—Body optional. Edison 9-6 battery; chain drive; wheelbase, 85 inches; pressed steel frame; tires, 34 by 4 and 32 by 4 inches.

Ohio—Four and five-passenger coupés and victorias. Prices, $2,300, $2,600 and $2,700 (the first being for the victoria). Exide batteries; shaft drive; wheelbase, 81 inches; tires, 34 by 4 inches.

Hupp-Yeats—Motor Westinghouse V; controller Westinghouse constant contact type; Exide battery; pressed steel, low hung frame; internal brakes; price, $1,750; f. o. b. Detroit.

Rauch & Lang—Both open and closed bodies are shown in several styles in the 1911 line of this company. A victoria to carry four passengers has chain drive; 40-cell battery; wheelbase 86 inches, and wheels 34.

Woods—Two chassis and numerous body designs are among the Woods offerings. Model 1012 has wheelbase, 86 inches, solid tires, 30 by 2 1-2 in front, 34 by 2 1-2 rear; expanding metal to metal brakes; special Woods motor; 4-pole series wound; five passengers; price, $2,900, with brougham body.

Waverley—This line is quite extensive, including all the standard bodies and a few beside. Model 69, runabout, has wheelbase 72 inches; Exide, Waverley or National batteries; motor, Waverley; price, $1,150, without top.

Many Western and Local Commercials

THE SECOND SECTION OF THE CHICAGO SHOW WILL HAVE A LARGE REPRESENTATION OF WESTERN BUILDS THAT HAVE NOT AS YET PENETRATED THE EASTERN TERRITORY

CHICAGO, Jan. 30—Practice, as it related to animal transportation, however fine it appeared, is looked upon as wanting in some particulars from the freight automobile point of view. According to the ways of the near-past, the automobile was used for long hauls and the horse was pressed into service for short haul work.

This must be regarded as an admission on the part of the advocates of the horse that he is a makeshift commercial proposition, one, in fine, that is only to be regarded as possible if a merchant has horses to use and considers it necessary to get some service out of them while they remain in fettle, knowing full well that the time is near at hand when it will be necessary to displace them with freight automobiles.

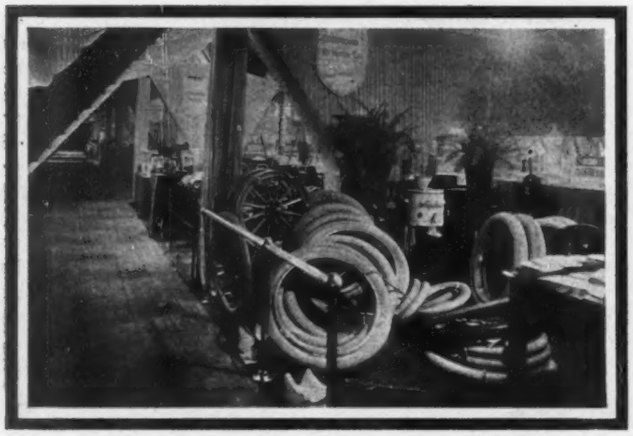
Of the several systems now being tried out, there is one that was handed down from the time when horse-drawn vehicles were used exclusively, *i.e.*, delivery by trucks to distributing points, with large storage houses at the points and after unloading the merchandise and storing it over night it was transferred to delivery with wagons drawn by horses and the short hauls were made; in other words, the goods were delivered. This plan is not only disastrous, due to the cost of maintaining storage buildings, but the delay incidental was always a source of great dissatisfaction to customers who want goods the day they are ordered.

In order to retain the advantages of the system it is now proposed to make the primary delivery by means of large automobile trucks, and to store the goods on the platforms of these trucks in large baskets or other convenient packages and by having the goods properly classified, to provide for their quick transfer for each route to the delivery wagon of that route.

This plan is not different from that in vogue in the United States mail service, in which mail bags are used to hold the mail as it is being sorted out during primary transportation, and when a mail car comes to a delivery point all that the man in charge has to do is to transfer the bags for that route to a delivery wagon which is held in waiting there for this express purpose. There is little or no delay attending the delivery of mail, as it will be readily appreciated. The mail method provided for

no storage accommodations for the material that is to be delivered at a certain destination. It is but a matter of having the wagons on hand according to a fixed plan. If the thousands of postoffices all over the country may be looked upon as customers in an illustration of the point to be made here, it only remains to transfer the idea to a regular delivery problem as it confronts a department store, when it will be seen that the idea of using trucks of great capacity on trunk avenues of traffic, will result in a great economy if delivery wagons are held at certain centers of delivery, ready to take the assorted goods and packages from the trucks and radiating out in the several directions, proceed at once to make the final delivery.

It is realized, of course, that automobile transportation, if it is to be on a basis of the utmost economy, demands that the automobiles be given "round house" attention. It is quite possible that some plan can be contrived by means of which the "round houses" so-called may be located, geographically, so that they will become the centers of transfer of goods as they are delivered by the trucks of large capacity to the delivery wagons of relatively small capacity. At all events it is now being realized that trucks and delivery wagons of the automobile type, must be managed by men who know how to do mechanical work, and the larger department stores, with their efficient management, are fast reaching the conclusion that good success is being interfered with by the mixed nature of the service, for, as



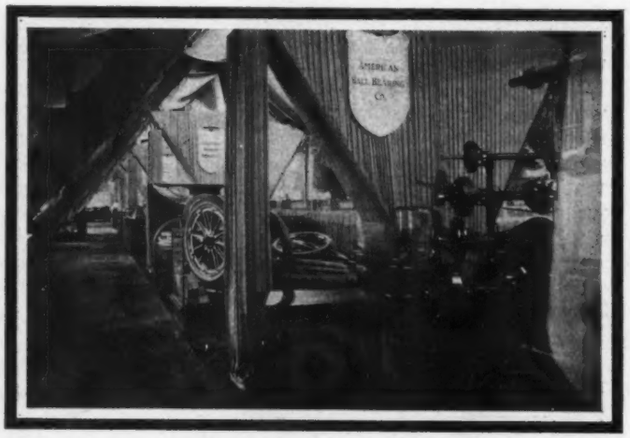
Diamond Rubber Co., A. W. Harris Oil Co. and Hartford Suspension Co.

will be readily appreciated, it is not in a man who merely knows all about horse-drawn vehicles to do justice to mechanical transportation methods, but this would not be such a serious matter were it possible for men to do the things that they do understand and allow other men to do their work. It is a great misfortune perhaps that men will get in each other's way and the champions of the horse, since they were on the ground first are more than likely to say "this new fangled notion is taking a hack at my bread and butter; I guess it is up to me to give it a black eye."

For those who have a large investment in horses and wagons, it is within the range of possibility that the two systems can be so isolated that the two classes of men will not be required to associate with each other. If they do come together, there is bound to be a clashing of thoughts and of actions, and as it stands to-day, since the men who drive horses are in the majority, they make the force of numbers tell, and that force ends in disaster for the automobile in not a few instances.

This trouble would not be so serious were it not for the fact that every merchant must come to the use of automobiles and there are very few merchants of good sense who are not aware of this fact. Any plan then, that will defer the adoption of the automobile, or make it a temporary failure, not only adds an expense account for the merchant to pay, but it prevents him from reaching the only conclusion that will permit him to remain in business and compete with his aggressive neighbor. There is no getting around the fact that when a customer makes a purchase he not only indicates that he desires a certain brand of goods, but he includes, and properly so, the idea that he is paying for service. That good service is to be had from the merchant who uses automobile transportation is an established fact, but can it be claimed that equally good service is possible under the older

Spicer Mfg. Co. and the Remy Electric Co.



American Ball Bearing Co., Hartford Rubber Works and Timken Roller Bearing Co.

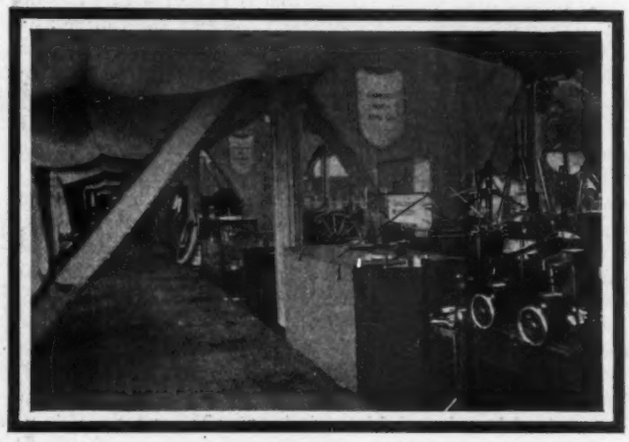
Heinze Electric Co. and the Consolidated Rubber Tire Co.

plan? It is these and other like ideas that are being discussed at Chicago.

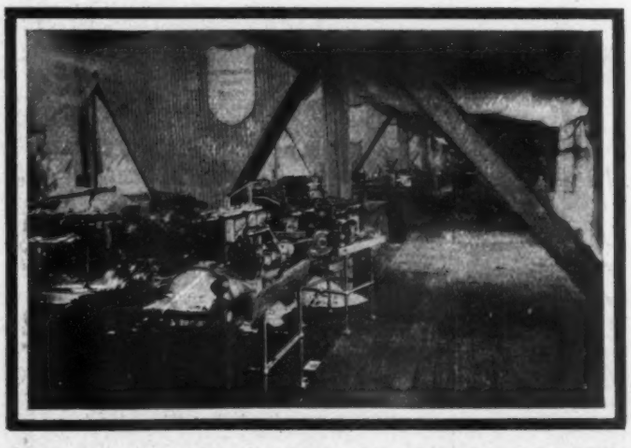
In addition to the eighteen makes of freight automobiles as herein described there will be two tractors, going by the list, with the probability of some additions at the last moment.

so that the Commercial Vehicle Section, which will open on February 6 and run for a week, closing on February 11, promises to be every bit as interesting as the commercial section of the Madison Square Garden show in New York, but there is an added angle to the Chicago situation due to the wide use for which freight automobiles are being put, even in the outlying

Morgan & Wright and Briscoe Mfg. Co.



Gabriel Horn Mfg. Co. and Goodyear Tire & Rubber Co.



Continental Motor Mfg. Co., Brown-Lipe Gear Co. and Baldwin Chain & Mfg. Co.

centers, whereas in New York freight automobile work is for the most part in the hands of the department stores, express companies, and a very few of the concerns, and those the very largest, will make a business of transportation work on a large scale.

Avery—This product as it will be exhibited is made by the Avery Co., of Peoria, Ill. The tractor with its specially contrived tire equipment, side chain drive and substantial radius rod, will probably be one of the attractions of the Chicago show. The output of the company includes a city truck, and in fine a full line of freight automobiles. Referring to the commercial truck the motor is of the four-cylinder type, 4 3-4 by 5 inches bore and stroke, rated at 45 horsepower. The cooling system includes a gear pump with a honeycomb and an auxiliary radiator. Oiling is accomplished with a force feed gear pump maintaining a constant level taking advantage of splash. Ignition includes a double storage battery, magneto and is of the high-tension jump spark type. Carburation is either by Schebler or Stromberg carbureters.

Brodesser—This is a motor truck product in which model A is rated at 1,500 and 2,000 pounds capacity, model B is rated at 4,000 pounds capacity, and there are several options including model C, which is rated at one ton capacity. These freight automobiles are built along standard lines, evidently intended for hard and continuous service. To give an idea of the general design of the machinery portion of these cars the model D-15 motor is described as having four cylinders vertical of the water-cooled type with a bore and stroke of 4 by 5 inches, developing 30 to 35 horsepower. The cylinders are cast in pairs and a Schebler carbureter handles the fuel which is fired in the com-

Jones Speedometer Co., Weed Chain Tire Grip Co. and C. A. Metzger, Inc.

bustion chamber by a Remy dual ignition system. The wheels are 34 inches in front and 36 inches in the rear, with 3 1-2-inch solid tires for the front and 4-inch solid tires for the rear. The chassis frame is of the standard channel section 5 inches deep, weighing 6 1-4 pounds to the foot. The wheelbase is 130 inches with a 60-inch tread and the price is $2,100.

Chicago Commercial—This product will be exhibited at section J on the main floor of the Coliseum and is made by the Chicago Commercial Car Co., 4707 Magnolia avenue, Chicago, Ill. Purchasers will have four options ranging between $1,300 and $1,500, the first price named being for the chassis only and the second price being for an open express body. The normal rating of the delivery wagon is 1,500 pounds and it is driven by a 16-horsepower motor of the double opposed type, water-cooled by the thermo-siphon system, provided with a two-speed planetary gear connected with side chain drive. The standard wheelbase is 100 inches and the tire equipment includes 34 by 2 1-2-inch front and 36 by 3-inch rear solid tires.

Cino—These trucks are made for a carrying capacity of 1,000 pounds, with a body space of 63 inches in length and 36 in width. The power is furnished by a four-cylinder motor located in front of the four-cycle type, rated at 40 horsepower. The cylinders are cast in pairs, the bore being 4 3-8 inches and the stroke 5 inches, the maximum power being developed at 1,200 revolutions per minute. Lubrication of the motor is by

splash, with a mechanical pump to maintain the proper level. 34 by 4-inch pneumatic tires are fitted to artillery wheels. The frame is made of pressed steel and the front axle is an I-beam drop forging. The wheelbase is 113 inches and the tread 56 inches. The Cino is manufactured by Haberer & Co., Cincinnati, O.

Clark Power Wagon—This chassis is fitted with a two-cylinder motor of the opposed type, located athwartships at a point on the chassis which brings the motor directly under the driver's seat. The bore is 5 inches and the stroke 5 1-2 inches, giving 20 horsepower. The carbureter is of the float feed type and the current is supplied for ignition through a U. & H. magneto and a supplementary set of batteries. The lubrication is force-feed and the water cooling is effected by thermo-syphon through a vertical tube radiator placed over the front axle. The flywheel is at the back of the motor, housing a cone clutch, and the power is transmitted through it to universal joints attached to the gearbox shaft. The transmission and bevel gear are situated in the same housing, the jackshaft being attached to the chassis frame, from whence the power is transmitted to the rear hub by means of silent chains. A wheelbase of 102 inches is provided, with a 56-inch tread. The driver's seat is situated above the motor. This vehicle is manufactured by the Clark Power Wagon Co., Lansing, Mich.

The Dayton—These freight automobiles are made by the Dayton Auto Truck Co., of Dayton, Ohio, and referring to model K, which is rated at 3 tons, the motor is of the four-cylinder, vertical water-cooled type, with the cylinders cast in pairs, the motor being rated at 35 horsepower. The valves come on one side, the cylinders being of the L type, so that one camshaft driven by an enclosed train accomplishes the work. The power is transmitted to a Hele-Shaw clutch of the multiple-disk type to the transmission including the jackshaft and differential in one housing. In addition to model K, model M is being prepared for market, the latter being a modification of the model K with the exception that the motor will be rated at 60 horsepower and the wheelbase will be 142 inches.

Economy—This product is from the plant of the Economy Motor Car Co., of Joliet, Ill. The chassis that is to be presented to a discriminating audience at the Chicago show is of light and substantial construction with side chain drive, using full elliptic springs in the rear, suspending an angle iron chassis frame above a square forged dead axle. At a point in front of the spring suspension at the rear a jackshaft is fastened to the lower side of the chassis frame and power is delivered from the motor through a planetary gear to the differential in the jackshaft, thence to the driving sprockets and by means of side chains to the driven sprockets on drums, which in turn are bolted to the artillery type wheels. The motor is of the double opposed type. Ignition is by magneto and the control is relatively simple, and in order to proide the greatest platform space the driver's seat is over the flywheel of the motor.

Frayer-Miller—The 3-ton model of this make of car will be seen at the show. The motor has a bore of 4 3-8 inches, a stroke of 5 1-8 inches and is rated at 28 to 30 horsepower. Cooling is by forced air draught controlling the supply of air to each cylinder. Lubrication includes a force feed oiler of the gear-driven type, piping a definite supply of lubricant to each main bearing. Cylinders, piston and connecting rods are oiled by splash. Ignition is by the Bosch dual type of magneto, with six dry cells as a supplemental source of electrical energy. The transmission is of the sliding selective type with four forward speeds and reverse, the gears are made of nickel steel, heat treated and the teeth are "stub" type. The steering gear is of the double reversible worm type with ball-bearings to take end thrust and means for adjusting to take up lost motion. The steering wheel is 22 inches in diameter. The speed of the car is 12 miles per hour. Two independent sets of braces are employed. The side chain drive is through 1 1-4-inch pitch, 3-4-inch by 3-4-inch roller chains. The wheels are 14-inch artillery type. The wheelbase is 136 inches, tread 66 inches. The car sells at $2,300.

Harder—This product is made by the Harder's Fire Proof Storage & Van Co., of Chicago, Ill. The output includes several models, including model B, which is a 3-ton truck selling at $3,850. The chassis will be fitted with any kind of a body to suit the intending purchaser. The motor is of the four-cylinder vertical type with a bore of 4 3-4 inches with a stroke of 5 inches, the horsepower rating being 35-40. The valves are ranged on the left-hand side using a single camshaft. Ignition is by jump spark, including magneto and dry cells. The radiator is of the honeycomb type and a Schebler carbureter is used. Lubrication includes a rotary gear pump. The clutch is of the cone type. Transmission is of the selective sliding gear type with three forward speeds and reverse. Power is transmitted through side chains to Sheldon type rear axles. The wheelbase is 120 inches with 60-inch tread.

Independent Harvester—Made by the Independent Harvester Co., of Plano, Ill. This product will be exhibited showing a four-cylinder air-cooled motor of the horizontal type with two flywheels and a considerable departure from conventional methods of design. In the transmission system the low speed is accomplished by pressing a push rod and allowing the driving sheaves to spread apart, thus permitting the chains to work on a smaller diameter on the driving shaft. The high speed works direct from the motor shaft to the rear wheels. The driven sheave is lined with hard steel and is 32 inches in diameter.

Mais—This truck is made by the Mais Motor Truck Co., Indianapolis, Ind., and the model that is to be placed on exhibit at Chicago is of substantial construction with a shaft drive using a four-cylinder motor in front with the cylinders cast in pairs. The motor is of the long-stroke type with a bore of 3 7-8 inches and a stroke of 5 1-4. The crankshaft is of nickel steel suitably heat treated and runs on F. and S. annular ball bearings. The connecting rods of nickel steel 11 1-2 inches center to center, and the wristpin bearing is 3 1-2 by 1 3-4 inches. The motor is designed with relatively stout parts, free from complication, and is for use under severe conditions of service. Water circulation is by means of a gear pump and a radiator of extra large capacity of the honeycomb type is provided with a large and efficient fan and a substantial means of driving same. The clutch is of the expanding shoe type and progressive sliding gear of the three-speed type takes the power from the clutch and delivers it through a shaft to the large axle. The control is left-hand and of substantial construction. Two sets of brakes are provided. The price of this car is $2,750 with a 1 1-2-ton chassis and $3,000 with a 3-ton chassis.

Marquette—This product is made by the Marquette Motor Vehicle Co., 3626 Halsted street, Chicago, Ill. The line includes a variety of freight automobiles in the various styles for delivery and heavy goods transportation work. The model B power plant is of the two-cylinder opposed type with the motor rated at 20 horsepower, having a bore of 5 1-4 inches and a stroke of 4 inches. The crankshaft is 1 3-4 inches in diameter and the main bearing on the flywheel side is 1 3-4 inches by 4 1-2 inches, while the crankpins are 1 3-4 inches by 2 1-2 inches. The connecting rod bearings are genuine Babbitt lined brass. Provision is made in the cylinder design for the removal of carbon by scraping.

Mercury—The freight automoblie which will be exhibited under this name is the product of the Mercury Mfg. Co., Union Stock Yards, Chicago. This car is of the light-delivery wagon type with the motor under the footboard in front and radiator fastened to the dash of the delivery wagon body. The transmission to the rear axle is through side chains in a conventional way with a gear reduction so contrived that the 40-inch wheels operate at the required speed using 1 3-4-inch solid tires. The front wheels are 38 by 1 3-4 inches, thus giving a better canting angle than they might otherwise take. The motor is of the two-cylinder opposed type, air-cooled, and rated at 12 horsepower, with a two-speed transmission of the planetary type with provisions for reversing. This car sells for $750 minimum to $850, including certain options of body work.

Rambler—Thomas B. Jeffery & Co., of Kenosha, Wis., is making provision to exhibit the Rambler combination chemical and hose truck, a brief description of which includes a 130-inch wheelbase chassis propelled by a 35-horsepower motor, the tire equipment being 36 by 5-inch front and 37 by 5 1-2-inch rear pneumatics. The body equipment includes a 40-gallon Halloway chemical tank with extra bottles, etc., 200 feet of 3-4-inch chemical hose in a perforated steel hose basket, one 22-foot extension ladder, one 12-foot extension ladder two pick back axes, 2 fire department lanterns, 2 hand extinguishers, plaster hooks, pike poles and door openers. The body has a carrying capacity for 850 to 1,000 feet of 2 1-2-inch fire hose, brackets which are not supplied but may be had as an extra.

U. S. Motor—The trucks under this name are to be exhibited by the United States Motor Truck Co., 216-220 Webster street, Cincinnati, O., and according to advices received from the company the product will be substantially without change of the former practice. The two-cylinder opposed motor has been provided with a new system of lubrication. The engine crankcase is provided with a cast-iron oil reservoir with a capacity of one gallon and a handy means of filling at one side.

Schmidt—The freight automobiles exhibited under this name are made by Schmidt Bros. Co., Chicago, Ill. The show models will include model F rated at 1,000 to 1,500 with an 18-horsepower, two-cylinder opposed air-cooled motor. The price of the chassis will be $975. Model C is rated at 2,000 pounds with a 20-horsepower two-cylinder opposed air-cooled motor, the price of which is $1,325. The company claims to have solved many of the problems for simplicity and it expects to attract favorable attention at section N-4.

Van Dyke—The freight automobile of this make, as it will be presented to the Chicago audience, has an 86-inch wheelbase with a standard tread, weighs 1,800 pounds with a carrying capacity of 1,000 pounds, and a loading space of 39 by 72 inches. There are numerous body options and the power plant is of the two-cylinder opposed type with a bore and stroke of 4 1-2 by 6 inches respectively, located under the seat with means for easy access. The motor is rated at 21 horsepower and the transmission is made through a Van Dyke friction drive taking power from the flywheel of the motor, transmitting it by means of a shaft direct to the live rear axle with a side lever control. A Schebler carbureter takes care of the fuel problem. This product is made by the Van Dyke Motor Car Co., Detroit, Mich., and the selling price of the regular output is $850.

Walker—The line of trucks known as the Walker are marketed by the Automobile Maintenance & Mfg. Co., with headquarters at 217 South Green street, Chicago, Ill. The product for 1911 includes four sizes of freight automobiles, the smallest of which is rated at 1,500 pounds, ranging up to 3,000 and thence to 4,000, and the largest size is given a rating of 6,000 pounds. These freight automobiles are of the electric type and provision is made in the battery compartment for either lead or Edison batteries. The bodies are built special for each purchaser. The feature of the Walker truck is in the rear axle, it being the case that the motor and differential, also the jackshafts, are housed in one torpedo-like shell.

What Prominent Men Think

EXPRESSION OF OPINION FROM MEN PROMINENT IN THE AUTOMOBILE BUSINESS RELATIVE TO A FEW OF THE LIVE TOPICS OF THE DAY

IN THE AUTOMOBILE it is desired to have an expression from you in relation to a few of the more important subjects that are being discussed from day to day, and the Editor will greatly appreciate any attention that the time at your disposal will permit you to give to the answering of the questions as follows:

(A) What will be the proper remedy to apply to the second-hand automobile situation?

(B) What should be the attitude of the makers of automobiles with respect to the many complications that are presented in connection with the present practice of the United States Patent Office as it relates to the issuing of patents?

(C) What will be the ultimate effect of the disposal by the Court of the Selden Patent question?

(D) What will be the ultimate relation of the makers of accessories to the makers of automobiles?

(E) What should be the attitude of the makers of automobiles toward racing and contests in general?

(F) What should be the proper attitude of the automobile clubs towards the makers of automobiles, and to what extent should the American Automobile Association be permitted to interfere with or influence the action of clubs?

(G) What are the faults in the laws that are placed upon our statute books bearing upon the police regulation of automobilists?

(H) What are the weaknesses of the New York State Law known as the "Callan Law," as it relates to the regulation of automobile traffic?

(I) What should be done toward the National control of automobiles under an inter-state law?

(J) What should be done toward the influencing of National appropriations for good roads, referring to trunk lines in particular?

(K) What will be the future method of seling automobiles and dealing with customers?

(L) What are the prospects for improvement in pneumatic tires, and the reducing of the cost from the tire maintenance point of view?

(M) What is the greatest cause for dissatisfaction among the users of automobiles?

(N) What is the best way to remove the causes of dissatisfaction and the placing of the automobile business on a basis of the utmost harmony?

(O) What is the most important reform that can be worked out to make the automobile business more stable and satisfactory as an economic factor, from the point of view of bankers and financiers generally?

(P) What are the prospects for the immediate future expansion of the freight automobile?

(Q) What is the greatest retarding influence of freight automobiles and their uses?

(R) What is the reason why some users of freight automobiles persist in maintaining that they are only suitable for long hauls?

(S) What is the greatest and most pressing necessity from the point of view of makers of automobiles at the present time?

(T) What is the proper sphere of usefulness and limiting scope of trade papers and magazines of the class which are devoted to the automobile art?

INDIANAPOLIS, IND., U. S. A., Jan. 25, 1911—Your favor of the 22d is at hand, asking for an expression regarding a few of the more important subjects in connection with the automobile industry that are being discussed from day to day. We beg to answer your questions, as follows:

Q. "A"—The proper remedy to apply to the second-hand automobile situation is the common sense business remedy as applied by dealers in typewriters, adding machines, etc., to a similar situation.

Q. "B"—The attitude of the makers of automobiles, with respect to the present practice of the United States Patent Office in issuing patents, should be, under present laws and decisions, to give due consideration to the rights of patent-owners, unless such owners are unreasonable in their expectations, and until such patents are declared invalid or limited in scope. The encouragement of inventive genius has been one of the greatest factors in building up this country, and recognizing that it is always easier to destroy than to build up, automobile-makers should not adopt any policy of wilfully destroying the results of the efforts of inventors, but, at the same time, such makers should co-operate effectively, in order to prevent unwarranted demands of any patent-owners, and to defend against such demands, if they are made.

Q. "C"—The ultimate effect of the disposal of the Selden patent question will be to bring about a stronger and broader or-

ganization of automobile-makers than has existed in the past.

Q. "D"—The ultimate relation of the makers of accessories to the makers of automobiles will be harmonious and similar to such relations in other lines of industry. There will always be specialists who can make certain articles more acceptably to the general buying public than the maker of a general line. This has been true in the horse vehicle industry since its inception.

Q. "E"—The attitude of makers of automobiles towards racing and contests in general should be one of encouragement in all cases where the machines used in such contests are bona-fide stock models. The experience gained by makers of automobiles in contests with stock models has been of incalculable value to automobile buyers. Such contests have done more to perfect and develop the modern motor car, in a comparatively short space of time, than the entire normal use of motor cars since they were first produced.

Q. "F"—The attitude of automobile clubs toward makers of automobiles should be one of proper consideration for the rights and duties of makers, as well as users. Such clubs can perform a great service to their members by teaching, in a broad-gauged, fair-spirited manner, the obligations which a motor car user owes to his machine and the maker of the same, as well as the results which any person may expect from a vehicle which, at the very best, is a somewhat complicated machine. It must be borne in mind that the railroad locomotive, which has been developed for generations, is never expected to go farther than from one divisional terminal to the next, without being thoroughly cleaned, inspected, adjusted, lubricated, and repaired if necessary. The motor car, which has been developed in a very short space of time, is expected by some to go over any kind of roads, at all speeds, from the minimum to the maximum, in the hands of any kind of a driver, from an inexperienced youth to an old man in senility, and if, under such conditions, within thousands of miles of driving, a spark plug should need cleaning, or a carbureter need adjusting, the manufacturer's attention is sharply called to his warranty. Automobile clubs and associations can do much toward educating the motor-car-using public relative to the rights, duties and obligations of all concerned, and until this is done, there will be unintelligent friction and misunderstanding between motor car users, dealers and makers, as well as serious criticisms of the motor car industry in general. There should be some central organization, with jurisdiction along certain lines, over local organizations.

Q. "G"—The principal faults in the laws placed upon our statute books, bearing upon the regulation of automobilists, consist of unreasonable limitation of speed under reasonable speed conditions. Every device which has for its purpose the elimination of time and distance in the transportaton of persons, goods or messages, has been a boon to mankind, and it is just as unreasonable to limit the speed of automobiles, where speed conditions are reasonable, as it would be to place unreasonable limits upon the speed of railroad trains and other conveyances carrying persons, packages or mail matter.

Q. "H"—We are not familiar with the provisions of the New York State Statute known as the "Callan Law," and would not presume to discuss its weaknesses.

Q. "I"—In our opinion, national control of automobiles under an interstate law should be encouraged; that is to say, full compliance with any State law by a motor car user should be recognized as a proper passport for such user while temporarily in another State.

Q. "J"—We doubt the expediency of attempting to influence national appropriations for good roads, but there should be a strong concerted action toward bringing about the establishment of the principle of State aid and State control of the principal highways of each State.

Q. "K"—In our opinion, the future method of selling automobiles and dealing with customers will be closely along the lines of present practice; that is to say, motor cars will be sold through dealers and branch houses. From the nature of the motor car, it is not a product that lends itself readily to the principle of mail order or direct distribution from maker to user.

Q. "L"—There are good prospects for minor improvements in pneumatic tires, but the chance for reducing cost from the tire maintenance point of view lays largely in the direction of producing artificial or synthetic rubber. Excessive tire cost in the past has been very largely due to overloading of tires.

Q. "M"—The greatest cause for dissatisfaction among motor car users comes from the fact that the extremely rapid development of the industry has not afforded proper opportunity for those using, selling and repairing automobiles to become impartially educated relative to the rights, duties and obligations of each to the other. Some motor car users have not fully appreciated what they could reasonably expect from the use of such a machine, and some dealers and manufacturers have failed to recognize that a certain consideration and duty to the purchaser still remained after a motor car was sold and paid for. Time only will "smooth out all the wrinkles" and bring about proper consideration of each party concerned for the other.

Q. "N"—The best way to remove causes of dissatisfaction and to place the automobile business on a basis of the utmost harmony, will be for automobile users, dealers and makers to frankly discuss the question of recognition, by each, of the rights and duties of the other, also to dispel the public notion that there is an unreasonable or abnormal profit in the manufacture and sale of motor cars, also, to bring to the attention of the world that there is the same distinction between different kinds of automobiles that there is between Waterbury and chronometer watches. In buying motor cars, as in buying watches, the man who buys a Waterbury undoubtedly gets full value for his money, but he does not get, and cannot expect, a "chronometer" motor car for a "Waterbury" automobile price.

Q. "O"—The most important reform that can be worked out to make the automobile business more stable, as an economic factor, from the point of view of bankers and financiers generally, will be to educate the public relative to the inherent difficulties and complications involved in the manufacture of such an article as a motor car, with a view of discouraging capitalists who are inexperienced in manufacturing from undertaking to make motor cars upon false notions of cost and profit. The automobile business will be entirely stable and satisfactory, from all points of view, within a comparatively limited time. A few failures will curb the tendency to overproduction, and allow a gradual alignment of the lines of production and demand, without any general collapse, which might be the case if all those engaged in the industry remained in a prosperous condition until the point of over-production had been reached.

Q. "P"—Our opinion as to the prospects for immediate future expansion of the freight automobile is indicated by the following: An average of 600,000 horse-drawn freight vehicles are made annually. The average life of such vehicles is ten years, which would indicate a total in use of 6,000,000 of such vehicles. The number of motor trucks which has been manufactured to date towards supplanting this number of wagons is comparatively infinitesimal. After the abnormal demand for motor trucks is satisfied, it will require not less than 100,000 motor trucks annually to supply the normal demand incident to increase in population and wearing out of old vehicles.

Q. "Q"—The greatest retarding influence against the use of freight automobiles is the lack of mechanical education of a sufficient number of drivers to handle such vehicles intelligently and for the best interest of their owners.

Q. "R"—We were not aware of the fact that any material number of users of freight automobiles maintained that they were only suitable for long hauls. There is certainly no ground for such belief, as the motor truck lends itself particularly to quick delivery and frequent stops.

Q. "S"—The most pressing necessity, from the point of view of makers of automobiles, at the present time, is to be conservative in the matter of production, and prudent in the matter of contracting for supplies.

Q. "T"—A proper sphere of usefulness for trade papers and magazines devoted to the automobile art is to impartially educate the general public in regard to the essential facts of the industry, which are of interest to all parties concerned. If misleading advertisements are published, or other misleading published statements made, it is certainly within the scope of usefulness of any trade paper to publish facts, in an impersonal manner, which will prevent false notions from becoming implanted in the minds of the public. There is certainly scope for courage and "nerve" upon the part of trade papers and magazines.

Nordyke & Marmon Co.

By G. C. Hanch Treasurer.

Predicts One National Organization of Makers

STREATOR, ILL., Jan. 26—We are in receipt of your letter of January 22d, and will answer briefly your questions as asked.

(A) A great deal has been said about the second-hand automobile situation and in giving this matter thought and talking it over with our different branch managers and salesmen, we think that the only practical settlement of it will be for each factory to handle, as much as possible, second-hand cars of its own make. Of course it will be necessary at different times to take in other cars, but they will have to be taken in at an exceptionally low price in order that the manufacturer selling the new car can realize near the allowance on the same.

(B) Regarding the attitude of the makers of automobiles in respect to the many complications that are presented by the present practice of the United States Patent Office, the complications which arise are in a great measure occasioned by the fact that up to the present time a great many manufacturers of automobiles as well as accessories copied original ideas of other makers and endeavored to secure patents on same and it has required a great deal of thorough investigation of the different patents before issuing rights on same.

(C) We think that the disposal of the Selden patent will lead to one national organization of automobile manufacturers comprised of the leading ones of the country. Of course this might not come about for some time, but we feel that this will be the ultimate end of the matter.

(D) Regarding the relation of the makers of accessories to the makers of automobiles, we feel that as the automobile industry ages a great many of the manufacturers will get their small parts from accessory manufacturers and that they will fill practically the same part in the automobile industry as the carriage hardware dealers have in the carriage and wagon industry.

(E) Although we have never done a great deal of racing and have never entered many cars in contests, we feel that this is a very good way to put your car before the public. There has been a great deal said in the past regarding the public timing of contests of this kind, but this kind of sport is clean and we feel that the public is demanding it and we look at it in a very favorable light.

(G) In reading over copies of the different laws placed in the statute books of our different States, we find that they are very inconsistent, due to the fact that the speed regulations are of such nature that it is almost impossible for an automobilist to drive a car without interfering with same, and we feel that they should be so adjusted that they should be practical and not theoretical. The laws, as they now are, would probably have done for a few years ago, but the large experience of the different drivers and the way in which the public looks upon cars necessitate a change, and we think that the State Legislatures, in the near future, will bring this about.

(I) In regard to the national control of the automobile laws, we feel that this would, no doubt, be a very good measure in some respects, and the one chief point would do away with necessitating a driver or an owner registering in the different States when he holds a license in any other State. This is not only expensive but it also creates a great deal of inconvenience.

(J) Regarding the influencing of national appropriations for good roads, we feel that there should be some means of taking hold of this situation higher up than the State, whereby two or three States could get together and make their appropriations and have their good roads merge into one another, thereby forming trunk lines. This has been talked of in different States, but to our knowledge not as a national proposition.

(K) This question would require a lengthy discussion which we would be glad to give later, if you desire.

(M) Regarding the causes for dissatisfaction among the users of automobiles, we believe that this question cannot be applied to the users as a whole, as we have found from reports from our salesmen and different branch managers throughout the country that 90 per cent. of the owners of automobiles are more than satisfied with their investment. This is not only from the point of view of the head of the household but of the entire family.

Very truly yours,

STREATOR MOTOR CAR COMPANY

By_____
Sales Manager

Sees Nothing Convincing in Track Racing

MUNCIE, IND., Jan. 25—Your interesting letter of inquiry received. We take pleasure in answering your various questions as follows:

(B) The only logical course for automobile manufacturers to pursue in remedying the present evils in the patent office is through concerted and aggressive importuning of representatives in Congress and the Senate to have legislative action taken to remedy the existing evils. It will only be through the most united and harmonious agreement that automobile manufacturers can hope to obtain any action on the revision of the present ineffective United States patent laws.

(C) In our opinion the ultimate effect of the disposal of the court of the Selden patent question will be merely to bring about an increased interest in the use of the automobile and will further the industry to a very appreciable extent, now that perfect freedom of action of all manufacturers is assured. We do not believe that the decision will induce new concerns to embark in the automobile manufacturing business, as it is coming to be well recognized that the manufacture of an automobile is not such a get-rich-quick proposition as it was imagined to be by a number of "mushroom" manufacturers.

(D) This question is indeed difficult to answer, but the present trend of evils would indicate a consolidation of interests and less cut-throat competition than prevails at the present time.

(E) As track-racing contests do not give the public any definite and convincing proof of the qualities of an automobile, which are most important in the eyes of the sensible user, and as track racing has become so commercialized and so deadly to human life, racing contests cannot increase to any appreciable degree the use of motor cars by the public. We do believe that hill-climbing and roadability contests do prove those qualities of a car which the motor car buying public wishes to know before investing in any particular machine and we heartily approve of such contests as furthering the interest and more general use of the automobile.

(F) At the present time the automobile clubs are being dictated to, to an undesirable extent, by the American Automobile Association, and we believe that this association should not, in any way, exercise a dominating influence on the action by these clubs in their attitude toward makers of machines.

(G) The sections in the statute books containing the police regulations of automobilists are defective in the main, in that

they permit the arresting official to give his side of the case in such a dominating manner that the defendant is not allowed to voice his defense with freedom of action. In other words, the statutes have so far discriminated and treat the automobilist as a menace to street traffic and to be dealt with without any consideration of his rights upon the streets.

(H) The defects of the "Callan Law" as it relates to the regulation of automobile traffic are that it tends to discriminate against the motor-propelled vehicle in favor of the horse-propelled vehicle, and its specific regulations as to speed are not based on sound requirements of moving motor cars in the congested city streets of metropolitan centers of population.

(I) An interstate law controlling the passage of motorists from one State to another in a broader manner than present interstate statutes allow would encourage long-distance touring and would be beneficial to the State creating more freedom of action to motorists in that the motor car tourist spends considerable money making these long-distance trips, and anything which would tend to encourage him would redound to the benefit of the State giving liberal concessions by encouraging him to spend more money within its confines.

(J) The American Automobile Association could do a far more important work than it is now doing by agitating the question of national appropriation for good roads as against the proposed large expenditures for canals, etc., as the betterment of roads would encourage the use of freight haulage by means of motor trucks, which can be moved very quickly from point to point and would effect enormous savings in the carriage of goods where haulage distances are not more than a few hundred miles.

(K) This question is rather too difficult for us to answer, but it is the opinion of the majority of motor car makers that the methods of selling and distribution which have become standard in certain of the old forms of machinery business will be employed in the motor car business as well, unless some better means of distribution should be discovered in the near future.

(L) The improvement in pneumatic tires and the reduction of the cost of tire maintenance will come about as a natural consequence of keener competition in the tire making business, and the necessity of rubber manufacturers to give the maximum value and to constantly make efforts to improve the quality of the materials in the construction of tires.

(M) The main cause for dissatisfaction in the use of automobiles is the fact that the motor car is a very new institution and the mechanical education of the general public has not progressed to anything like the same degree as has the evolution of the present day automobile in the last few years. We believe that the proper education of the public in the care and maintenance of an automobile and its limitations will do more to increase the pleasure which the owner receives from his car and give more general satisfaction to both maker and user of motor cars.

(N) It is extremely difficult for us to say how the causes of dissatisfaction can be removed but they will ultimately be righted, we do not doubt.

(O) In order to change the point of view of bankers and financiers in general on the automobile problem, the most important reform which makers can effect by concerted action would be to conduct an educational campaign in which the value of the motor car, outside of its purely material and utilitarian features, would be stressed, such as the affordability and the health-giving features of the motor car. At the same time the makers and their distributors should deal with the other side of the proposition of buying motor cars, *i. e.*, those few occasions which have caused the banker and financier to look with so much disfavor upon the automobile, the buying of cars by people who have no earthly use or reason for purchasing an automobile. These instances have hurt the cause of the industry immeasureably and have been due to the cupidity of dealers to effect sales regardless of consequences which their imposition causes.

(S) To teach the automobile buying public to properly drive and take care of a machine after investing their good money would relieve the maker of the vast number of unreasonable demands made on him by owners who have not appreciated the necessity of properly caring for their machines and blaming every trouble which they get on the maker of the machine when in nine cases out of ten it is not the maker's fault.

(T) The proper sphere of usefulness of trade papers and the magazines devoted to the automobile art is to effect through their influence the needed reforms which have been discussed above and to take the initiative in conducting an educational campaign to teach automobile owners how to derive the utmost satisfaction from a motor car by intelligent driving and maintenance. A few of the trade papers and magazines have taken the much desired initiative in these matters and THE AUTOMOBILE especially is to be congratulated on the articles which it has been running in recent months dealing with these very important subjects.

Yours truly,
INTER-STATE AUTOMOBILE CO.

Great Western Manager Believes In Contests

PERU, IND., Jan. 26—In response to your letter of the 22d, we are pleased to express our opinions on the following subjects:

(A) We believe that the true market for second-hand automobiles is with the class of people who cannot afford to buy new ones. We believe that second-hand cars handicap the automobile dealers only insomuch as they overload themselves by trading beyond their means. In other words, if a dealer has only financial ability to handle three thousand dollars' worth of second-hand cars he should not exceed that amount and should devote his attentions to selling to those who have no old machines to trade in until such time as he is again able to handle used cars.

(E) We believe that automobile makers should pay particular attention to automobile contests in general, as they not only promote interest in automobiling but teach many points of improvement to the automobile builder. We are ourselves desirous of contesting in endurance runs, as anyone building a stock car good enough to stand up in the average endurance run certainly builds a car suitable for the driving public.

(K) The automobile business has reached a point where salesmanship and advertising come to the front just the same as in any other staple line of business. The public demands fair treatment and must have confidence in the salesman and dealer. Active salesmanship along good business lines is needed to-day in the business more than ever before.

Yours very truly,

GREAT WESTERN AUTOMOBILE COMPANY.
E. Mackmorris
General Manager.

Chalmers Discusses the Second-Hand Car Problem

DETROIT, MICH., Jan. 27—Mr. Chalmers has instructed us to send you the following answers to questions contained in your circular letter of January 22:

(A) "The second-hand car problem is unquestionably one of the greatest in the automobile industry. Solutions of various kinds have been tried, none of them with absolute success. In my opinion Philadelphia has one of the best arrangements for handling second-hand motor cars. The Dealers' Association of that city maintains a clearing house which fixes prices to be paid for the different models of the various makes of cars. No member of the association accepts a second-hand automobile in trade until it has been appraised and a price fixed by the clearing house.

This system prevents unfair competition, since the clearing house gives the same price to each member of the Dealers' Association. It eliminates all bidding for a sale among dealers.

"I have thought of another plan which might be tried in connection with second-hand cars. My idea would be to form an association of manufacturers, admitting only those who build standard cars. This association would be in the nature of a big insurance company. Each manufacturer would pay a certain tax on each car that he built. As this car was sold the purchaser would be told that for the payment of a premium annually his car would be insured against all breakage and eventual total disability. When an owner had an accident the damage would be estimated just as the insurance companies of the present day estimate personal injury, and he would be compensated for the cost of repairs. When his car became totally disabled, instead of being patched up and eventually sold as a second-hand car, it would be thrown on the junk heap, the manufacturers' insurance company standing the loss out of the tax paid by the various members.

"At the present time the country is accumulating a vast stock of second-hand cars, many of which are really valueless as automobiles and have a tendency to persuade prospective buyers that motor cars are risky investments. This should not be. There is no reason why an automobile, like any other piece of machinery, should not eventually wear out. When a car has delivered in service a satisfactory return upon the original investment I do not see why we should not acknowledge that it is worn out and cast it aside. The insurance plan which I mention would take off the market all of the worn-out cars. If anything of value remains in these cars they could be sold as scrap iron and perhaps the materials in them could be remade into material available in some phase of manufacture.

"This is, of course, only an idea. I do not know how it would work out, for I have not investigated with a view to forming such an organization. It is evident at once that such an insurance association would require immense financial backing and a very high class of appraisers, yet I believe the plan could be worked out in some practical way to solve the second-hand car problem.

(E) "I believe that automobile manufacturers should give their support to contests. The Chalmers Motor Company has made a big investment in motor contests and we believe we have had a good return. I think the greatest benefit from contests comes through the knowledge the manufacturer gets of any deficiencies which may exist in his cars.

"I am more in favor of endurance contests than of track and road races. A long distance road race in which cars are forced to maintain high speed undoubtedly gives the buying public a great insight into motor car construction. Yet no one can deny that these are unusual conditions of motoring. The endurance contest, on the other hand, offers quite as thorough a test of a car's efficiency, but under conditions of hard touring. The Glidden tour is, to my mind, the most practical test for motor cars which has ever been devised.

(J) "There can be but one answer to this question. The United States certainly needs better roads. Especially do we need trunk lines connecting the principal cities of the country. I do not believe that these roads can be built successfully by the individual States. In the first place it is hard to get two or more States together on the proposition of building a good road. In the second place, comparatively few States will make appropriations sufficiently large to push this work through with sufficient dispatch. As a general rule, State road building consists of the improvement of a few miles of road in one place, a few miles in another place and so on. In the meantime the general road proposition is not improved at all and by the time money is raised to continue the improvement work the original work has become practically worthless.

"I think, therefore, a big national appropriation should be made. There should be sufficient money available to put through the much-needed trunk lines. Once they are built I believe the individual States will build branch lines. With this system in effect it would be but a few years until the United States could boast as fine roads as Europe."

Very truly yours,

CHALMERS MOTOR COMPANY.
Advertising Department.

Ignorance Is Greatest Cause of Dissatisfaction

YORK, PA., Jan. 26—(A) The dealer should not exchange; should agree with the purchaser of new car to sell old car at its actual value and charge commission for same.

(B) The United States Patent Office upon issuing a patent should guarantee its validity. I think that the United States Patent Office would do well to follow the German system.

(C) The conclusion of the Selden Patent litigation clarifies the situation. The automobile industry is now on so firm a footing that it will go on as any other ordinary manufacturing business.

(D) This is a large question. Standardization may revolutionize the accessory end of the industry.

(E) The manufacturer of automobiles should enter races and endurance contests very sparingly. Automobile building is an industry, not a sport. When business and sportsmanship are combined very little is left of the latter.

(F) I cannot see why automobile clubs should have anything to do with the manufacture of automobiles. A club is a social organization; an automobile manufactory is a business.

(G) Owing to the comparative infancy of the automobile industry, naturally the police regulations are still in a cloudy state. Time and enlightened public opinion will regulate the laws pertaining to automobile traffic.

(H) This law is so little known as yet that it is difficult to express an opinion on the same. Many errors have been found in it which will be corrected to some extent during the present session of the New York Legislature. Without going deeply into the subject, I should say that the law places hardships on the automobile owner and chauffeur. I am of the opinion that a chauffeur should be regarded as any other mechanic and should not be forced to pay a license fee in order to earn his livelihood. He should be given a license "gratis."

(I) There should be an interstate law.

(J) I have not a well defined opinion as yet.

(K) From a manufacturer's standpoint, in my opinion, the local agency proposition is the best.

(L) The improvement in pneumatic tires seems to be steady and the reduction in the weight of an automobile, through scientific designing and the balancing of its weights, will certainly reduce the cost of tire maintenance.

(M) I think the greatest cause of dissatisfaction among automobile users is the fact of their own want of knowledge as to how an automobile should be used; and the abuse of automobiles, through incompetent chauffeurs—which is due again to lack of the owner's knowledge—is the greatest source of complaint.

(N) Square dealing with the purchaser of an automobile and square dealing as between the dealer, purchaser and manufacturer.

(O) The automobile business is no different in principle from any other manufacturing business; should be run on safe, economic lines. Bankers would then lend their aid to the automobile manufacturer as well as to any other.

(P) Immediate future expansion of freight automobile will be tremendous.

(Q) The over-conservativeness of a merchant is a lack of knowledge of the facts.

(S) The avoidance of building too many cars.

(T) Spread a greater knowledge of their use and necessity.

President Thos. C. O'Connor
of the Pullman Motor Car Co.

Disposal of Selden Case Benefit to Retailers

SHELBYVILLE, IND., Jan. 24—Your circular letter of the 22d at hand. It would take a book to give our views on the various topics mentioned, but will try and give you an expression on those in which we are directly interested.

(C) The disposal of the Selden Patent question is going to be a benefit to the retail salesmen in that it will save a great deal of time making explanations and answering foolish questions. From our viewpoint it will not effect a sale of either licensed or unlicensed cars, as the general public have bought cars on value shown rather than from the fact that they were licensed or unlicensed cars. We have unlimited confidence in the public buying that which has the most value and do not believe that the reversal of this patent is going to be of any benefit to the unlicensed car manufacurer.

(K) We cannot see how it is possible for the manufacturer to sell his cars to the dealer except on a cash basis, and as the business develops the manufacturer who takes care of his agent and his agent's customers is going to be the manufacturer who will remain in the business. The day for treating customers as "suckers" is past.

(N) The best method of removing the feeling of dissatisfaction which exists with most manufacturers and agents would be to eliminate price cutting so that said manufacturers and agents would secure a legitimate compensation for the work they are doing. There is no business in existence at present which, volume for volume, shows as little profit as the selling of automobiles, and there will be dissatisfaction as long as this condition exists.

(O) It will never be possible to convince the bankers and financiers generally that the automobile business is an economic factor as long as the automobile business requires capital which the banker and financier needs in his business. It would be just as easy to convince a bull dog that a black cat was necessary to the welfare of the world as to attempt to convince the bankers and financiers that anything which does not turn profits into their pockets is a necessary factor.

Not being interested in trucks or other propositions, the other questions in the circular do not interest us.

Very truly yours,

CLARK MOTOR CAR CO.
Martin Wolfe
General Manager.

Sell Cars on a Strictly Cash Basis

CORTLAND, N. Y., Jan. 24.—Replying to your letter of the 27th inst., would say that as our branch of the business is motor truck work, we do not feel qualified to answer the various questions, as they have a more direct bearing upon the pleasure end of the business.

We would say that from a financial and economic point of view, we think the most important reform that could be worked out would be to conduct the sale of pleasure automobiles and motor trucks on a strictly cash basis, eliminating notes, checks dated ahead, and the various other subterfuges that are employed to get a car, without actually paying the cash for it.

We know from personal experience with our local banks that they much prefer us to ship trucks with sight draft attached to bill of lading for full amount, and from the very beginning of our company we were kindly advised not to accept paper from our customers, and all in all this is probably the most important item in the selling end of the automobile business.

Yours respectfully,

CORTLAND MOTOR WAGON COMPANY.
Edson P. Starks.

Opinions of One of the Knox Staff

SPRINGFIELD, MASS., Jan. 25—We have your list of questions of January 22.

(A) A second-hand touring car of reputable make and fairly decent construction can be converted into a light package delivery car at comparatively small expense and should give very good service in this class of work.

(B) Manufacturers should co-operate in an attempt to simplify the complications now encountered in the issue of patents.

(C) A general clearance of the atmosphere, but no radical changes in prices or methods.

(D) Cordial.

(E) Racing and contests should be sought only as a means of publicity.

(F) Individual clubs can be permitted to determine their attitude toward the makers without the influence of the A. A. A.

(H) The Callan Law would prove more efficient if it contained more regulation of owners and drivers other than paid chauffeurs.

(I) The division of the whole country into sections of uniform size with a separate registration and license for each section would probably prove more efficient and less burdensome than State registration. It would necessarily have to be under National control.

(K) Automobiles will probably ultimately divide themselves into two main classes and the selling methods are likely to be governed by class conditions. The medium or low-priced car will be marketed in standard form while the higher-priced custom-made car will be handled much as it is to-day, and the buyers of the latter class will undoubtedly demand much more attention from the manufacturers and dealers.

(M) Lack of thorough testing and inspection of all details before car is delivered to the customer.

(O) A standardization of details, methods of business and merchandise, a closer personal relationship between all parties.

(P) Extremely good, provided that the expansion takes place moderately and in proportion as business men are able to adjust and accept it.

(Q) A lack of knowledge on the part of business men regarding the type, size and number of freight vehicles required for their work, and of the methods necessary for operating and maintaining the vehicles. A new unit of transportation is in the field; it is much more than a substitute for horses. The successful installation of motor trucks will often require radical changes in methods of shipping, loading, unloading, types of bodies, and even delivery schedule.

(R) Because of a short-sighted policy which requires a motor vehicle to work on a horse vehicle schedule.

(S) Anything and everything that will tend to place the industry on a strictly business basis. The elimination of all elements that up to the present time have made possible the appellation of "automobile game."

(T) Automobile publications should be divided into two classes which your question suggests, viz.: trade papers and magazines. The sphere of each is then determined.

Your letter is not addressed to any one in particular, and as it has been referred to the writer for reply, it represents simply his individual opinions and it is not offered as representing the opinion or policy of this company.

Yours truly,

A. O. Fuller.

Tire Improvement of Vital Importance

BEVERLY, MASS., Jan. 26—We have your letter of Jan. 22d, and appreciate this opportunity to express our opinion on one of the subjects suggested in your letter. This is under (L), relating

to pneumatic tires, which we believe is of as vital importance to the motor car owner, both for pleasure and commercial work, as any subject pertaining to the automobile business.

In our opinion the manufacturers of automobile tires are using every effort to perfect and improve their goods. It may be possible, however, that improvements in fabric or in compounding the rubber may be brought out that are not known to the tire makers at this time, and which will do much toward lengthening the life of the tire.

We believe, however, that the greatest source of tire trouble, to-day, is due to excessive weight on the tires, and to the fact that cars are equipped with too small a number of gear changes, making too great a shock on the tire when gear is shifted from a low to an excessively higher gear ratio, and especially in the hands of an inexperienced operator.

Weight is a very serious factor, and weight must be considered more seriously in the successful automobile of the future, and many cases of dissatisfaction can be traced direct to the fact that the cost of tire maintenance, alone, was several times the amount of all other costs to the operation of the car, for the reason that the tires were forced to carry a load beyond the possibilities of the fabric that is at the hands of the tire makers to-day. And, a great many purchasers of automobiles, who had carefully considered the use to which they wish to put a car, the possible cost per mile of gasoline, lubricating oil and general wear and tear, have been greatly surprised to find that their total cost for the season exceeded this many times, and to a point where the use of the automobile was not a good business proposition due entirely to the misjudgment in designing and to the fact that there was too great a shock in shifting gears.

In our opinion, in the successful automobile of the future the question of weight will be given the serious consideration it deserves, and the successful automobile will be equipped with a greater number of gear ratios, not less than three, and possibly six forward speeds, which will at once and effectually remove the cause of excessive costs and worry of tire maintenance.

Yours very truly,

Cameron Car Co.
E. S. Cameron
Manager.

Second-Hand Trucks a Doubtful Proposition

PORT HURON, MICH., Jan. 24—Replying to your inquiry regarding our opinion on the various questions as covered by your letter of January 22d, the writer has endeavored to answer as many questions as possible, consistent with the information at his disposal.

Regarding question marked (A), we feel that our opinion as manufacturers of commercial cars only is somewhat different than possibly would be the opinion of a pleasure car manufacturer. Inasmuch as the commercial car is purely an investment which brings returns in dollars and cents, we believe that the purchaser should be extremely careful in considering an investment in a second-hand car of this kind, as ordinarily the one from whom he is about to purchase has found this particular car to be a bad investment, otherwise it would not be for sale, and it surely is not a good investment to purchase any truck, except the very best, if one expects to get satisfactory results. This does not apply at all to the pleasure vehicles, as we appreciate that there are a great many reasons why owners should find it necessary or expedient to dispose of their car, other than the fact that it has proven unsatisfactory.

Question (B)—We believe that there should be a more thorough investigation by the Patent Office both of foreign and domestic patents, also extreme care should be exercised in granting of patents covering basic principles.

Question (C)—Less restricted competition, with gradual but final consolidation of the larger manufacturers.

Question (D)—Standardization, with the final result that the more important accessory manufacturers will become subsidiary companies.

Question (E)—Stock car contests should receive the encouragement of manufacturers, particularly endurance contests.

Question (F) Uniformity of rulings and elimination of favors shown larger manufacturers; controlled by A. A. A. in a general way enforce above rulings.

Question (J)—All possible influence should be brought to bear on representatives, insisting upon the enactment of legislation toward the achievement of this end.

Question (K)—Direct factory representation, through branch houses.

Question (M)—Ignorant operation and carelessness.

Question (P)—We believe the freight automobile will very shortly become the principal factor in the automobile business.

Question (Q)—Ignorant operation and production of inferior cars by unscrupulous manufacturers.

Question (R)—Poor loading facilities and careless operators, who will insist on leaving motor running when making long stops. Except for the above-mentioned reasons, there should be no reason why a gasoline car should not show good results on short hauls.

Question (S)—Bringing the present product up to date in design and considering efficiency and durability rather than price in production of freight automobile.

Trusting that the above may be of some value to you, we remain,

Yours very truly,

Cass Motor Truck Co.
By A. L. Mathewson
General Manager.

The Situation in a Nutshell

WHITE PLAINS, N. Y., Jan. 24—Answers as follows:

(A) Manufacturers or dealers who sold the cars to control.
(B) Unless an actual invention, to be refused.
(C) The last court decision and opinion given will be and is final.
(D) Manufacturers will equip with all accessories on their cars.
(E) Makers ultimately will not consent to enter same, but will leave it to owners the same as horse racing.
(F) No one is tickled to death at interference.
(G) No fault of the law; the fault lies in the enforcement.
(H) Too many restraints that cannot be enforced or receive the respect of operators, as they are not good sense.
(I) The sooner it is done the better for all concerned.
(J) Don't attempt it as it's too long-winded and results in nothing.
(K) Practically no change, but more responsible firms will handle them than have in the past.
(L) Prospects good, but when? "That is the question."
(M) Cost of tires.
(N) Let it work out its own salvation.
(O) Less talk about output and lies about actual sales.
(P) Good.
(Q) Cost of maintenance.
(R) "Truth is mighty and must prevail."
(S) Cash on hand.
(T) To tell the truth and no favoritism.

Yours very truly,

C.J.G. MOTOR CAR COMPNY.
George J. Grossman
GENERAL MANAGER.

Two-Cycle Thermal Efficiency*

BY W. WATSON, A.R.C.S., D. Sc., F.R.S., AND R. W. FENNING, B.Sc. DESCRIPTIVE OF A SERIES OF TESTS WITH A TWO-CYCLE MOTOR, COMPARED WITH RESULTS OBTAINED FROM A FOUR-CYCLE MOTOR.

1. **Object of Tests.**—A fairly complete series of tests on the efficiency of a typical four-cycle petrol engine having been carried through, the results of which were communicated to the Institution in a previous paper,† it seemed that it would be of considerable interest to carry out a similar series of experiments with a two-cycle engine, a type which, though hardly employed at all on motor cars in this country, is yet very largely used on boats, particularly in America.

2. **Description of Engine.**—The engine tested was a single cylinder Day engine intended for marine use, rated by the makers at 2.5 horsepower, at 900 revolutions per minute, the cylinders having a bore and stroke of 3 1-4 inches. From the sectional elevation of the engine (Fig. 1) it will be seen that crankcase compression is employed, and that the engine is of the three-port type—*i. e.*, the admission of the fresh charge to the crank-case is governed by the piston, the lower edge of which uncovers a port when near the top of the stroke. The upper edge of the piston on the downward or working stroke first uncovers the exhaust port, and then the inlet port, which is in communication with the crank-case.

The valve diagram (Fig. 2a) gives the position of the crank at the opening and closing of each of the three ports, and enables a determination to be made of the time during which each port remains open.

A deflector plate cast on the top of the piston is intended to assist in preventing the incoming charge from passing direct from the admission to the exhaust port, and so escaping from the cylinder with the exhaust products.

The ignition is by means of a high-tension trembler coil and battery, the timing being adjustable. It is of interest to note that the maximum spark advance which could be obtained as the engine was sent out by the makers was as shown in Fig. 3, where the speed is 900 revolutions per minute. By filing away the stop which limited the travel of the ignition lever, so as to admit of much more advance, the diagram took the form shown by the dotted line in Fig. 3; an increase of power of 15.6 per cent. being thus obtained at this speed, while at higher speeds the increase was even more marked.

The carbureter is of the single jet, float-feed type, fitted with a throttle valve and a hand operated extra air valve (Brown and Barlow bicycle type). During the tests the throttle and extra air valves were always kept full open (except in a few cases), so as to reduce the throttling of the incoming air to a minimum. Strength of mixture was adjusted by means of a needle concentric with the jet, and by means of which the effective area of the jet could be adjusted. Both air inlets to the carbureter were connected by a pipe to a large box, used in measuring the air taken by the engine.

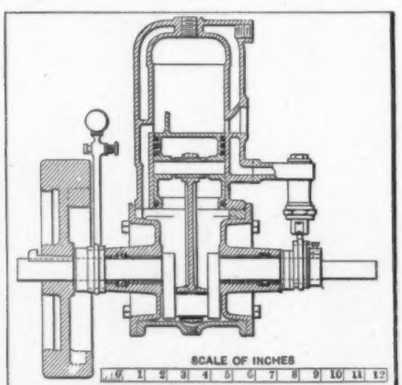


Fig. 1—Sectional elevation of engine used in the test viz., 3-port type

The exhaust pipe is 1 1-3 inches internal diameter, and about 12 feet in length, and is provided with a silencer at a distance of 22 inches from the engine. A small pipe, used when taking the exhaust gas samples, is connected to the exhaust pipe between the exhaust port and the silencer.

The cylinder is water-cooled, the circulation being maintained by a plunger type pump driven by the engine.

The lubrication is by means of grease cups to the main bearings, and by drip to the inlet pipe, the oil being swept into the crankcase by the fresh charge as it enters.

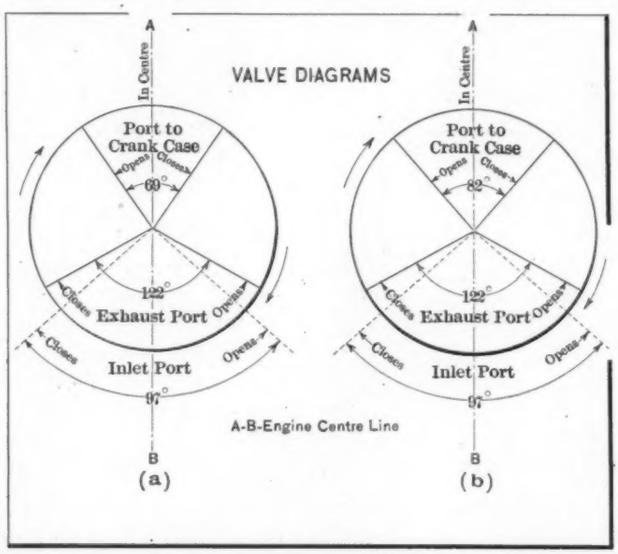


Fig. 2—Valve diagrams showing position of the crank at the opening and closing of each port

3. **Method of Conducting Tests.**—A dynamo, driven by means of a belt, was used to absorb the power; it was separately excited, and the current generated was led through adjustable resistances by means of which the output of the machine could be regulated and the speed of the engine controlled. Variations in the speed during a test were detected by means of a Weston electro-magnetic speed indicator, but the values for the speed given for the different tests were obtained by means of a revolution counter and a stop-watch, both being started (and stopped) at the commencement (and end) of each test. No direct measurements of brake horsepower were attempted, since it would have been difficult to allow for the losses in the belt, and for those due to the strain put on the bearings owing to the large amount of back tension found necessary to prevent slipping. The indicated horsepower was obtained by means of the diaphragm optical indicator described in the paper* on the four-cycle engine. In general four diagrams were taken (by photography) during each test, and the mean effective pressure was deduced by calibrating the indicator and determining the area of the diagrams by means of a planimeter.

* A paper read before the Incorporated Institution of Automobile Engineers. Printed in The Auto, London.
† "Proceedings Inst. A. E.," vol. 3, page 387, 1908-09.

*Loc. cit.

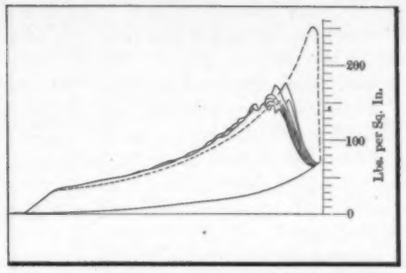


Fig. 3—Diagram of curve with ignition as set by the makers and as obtained by increasing spark advance

The arrangements for measuring the petrol consumption were similar to those employed in the previous tests, *i. e.*, provision was made so that the engine could be fed either from a tank or a graduated vessel, a three-way cock being used to change from one to the other. Each test occupied the time during which 100 cubic centimeters of petrol were consumed, the average duration being about 4 minutes. The temperature of the petrol was measured, and throughout the tests the same sample was employed, the calorific value being 18,600 British thermal units per pound.

The weight of air supplied to the engine was determined by measuring the drop of pressure between the two sides of a circular aperture in a thin metal plate forming the inlet to a box from which the engine drew its air. The volume of the box was about 22 cubic feet, and it was provided with an india-rubber diaphragm to assist in reducing the pressure fluctuations in the box. The difference in pressure was measured by a water gauge graduated in hundredths of an inch, and the size of the orifice was so chosen that the pressure difference was between 1 inch and 1 1-4 inches.

The exhaust gases were collected in glass sampling vessels, having a capacity of 300 cubic centimeters. The tube from the exhaust pipe was fitted with a three-way glass cock, one branch leading to a non-return valve and the other to the top of the sampling vessel. During the preliminary adjustments before a test, the exhaust gases were allowed to blow through the non-return valve, and thus cleared out all the air from the connecting tube; the sampling vessel was also filled with mercury. When the test commenced, the cock was so turned that one end of the sampling vessel was connected with the exhaust pipe, and the mercury was allowed to flow away slowly from the other end, so that the collection of the sample continued throughout the time the test lasted. In this way an average sample of the exhaust gases, uncontaminated by atmospheric air, was obtained. The method of performing the analysis was the same as that described in the previous paper; the carbon dioxide, free oxygen, and carbon monoxide being directly determined, while the hydrogen and marsh gas were calculated by means of Mr. H. Ballantyne's relation,* namely, percentage of hydrogen is 0.36, and percentage of marsh gas 0.12, of that of the carbon monoxide.

The trials made range themselves under four speeds, namely, 600, 900, 1,200 and 1,500 revolutions per minute, the speed being kept as nearly as possible constant at one of these values during any one test.

To study the way in which the charge supply to the cylinder varies at different speeds, indicator diagrams were taken from the crankcase in which the charge is compressed before being delivered to the working cylinder. Diagrams were also obtained from the working cylinder at the various speeds, using a thin diaphragm in the indicator so as to obtain an open scale. The crankcase diagrams were averaged in the ordinary way by means of a planimeter, and the power consumed in doing the pumping work was calculated. Specimen diagrams taken from the crankcase are shown in Figs. 5, 6, 7 and 8.

4. Loss of Fresh Charge Through Exhaust Port.—From the construction of the engine it is evident that there is every probability of some of the incoming charge escaping through the exhaust port with the exhaust products. Since any of the fresh charge which escapes in this way will carry with it a certain amount of petrol vapor, such a loss is a distinct disadvantage, and it is important to determine its amount at various speeds.

In the case of this engine, when the mixture was richer than 1 of petrol to 14 of air (by weight) the exhaust gas contained both carbon monoxide and free oxygen. Now in the experiments on the four-cycle engine it was shown that whenever there was carbon monoxide in the exhaust there was no free oxygen. In the four-cycle engine the exhaust and inlet valves were never open at the same time, and hence it was impossible for the fresh charge to find its way into the exhaust, unless one of the cylinders was not firing. The explanation of the presence of the oxygen in the case of the two-cycle engine evidently is that some of the charge has escaped in the exhaust pipe without combustion taking place in the cylinder, and from the proportion of oxygen present we can determine by calculation the friction of the charge supplied through the carbureter which escapes combustion in the cylinder, and is lost.

The method of performing this calculation is best explained by means of an example:

At a speed of 1,218 revolutions per minute the analysis of the exhaust gases gave the following results, by volume:

$CO_2 = 7.4$ $H_2 = 2.0$ } Calculated from
$O_2 = 4.2$ $CH_4 = 0.7$ } per cent. of CO.
$CO = 5.6$ $N_2 = 80.1$ By difference.

Now, in atmospheric air 0.266 volume of oxygen is mixed with one volume of nitrogen, and therefore with the 80.1 volumes of nitrogen there must originally have been 80.1×0.226, or 21.3 volumes of oxygen. Of this 21.3 volumes of oxygen entering the engine, $21.3 - 4.2$, *i. e.*, 17.1, volumes took part in the combustion, and the remaining 4.2 volumes escaped through the exhaust port. Since the oxygen in the incoming charge bears the same ratio to the oxygen which escapes as does the total volume of the incoming charge to the total volume of the charge which escapes, we get:

$$\frac{\text{Volume of charge which escapes}}{\text{Total volume of charge}} = \frac{4.2}{21.3} = 0.197,$$

i. e., 19.7 per cent. of the charge escapes unburnt at this speed. To obtain satisfactory results for the percentage of escaping charge by this method, it is necessary to use a fairly rich mixture, so that there is at least 1 per cent. of carbon monoxide in the exhaust gases.

As a test of the accuracy of the deductions which can be made by the above method we may calculate what would be the composition of the exhaust gases supposing we were able to eliminate the portion of the gases which escaped combustion. Returning to the example considered above, 4.2 volumes of oxygen must have been accompanied by 4.2/0.266, *i. e.*, 15.8 volumes of nitrogen, and hence the composition of the exhaust if no unburnt charge were included would be:

$CO_2 =$	7.4 volumes or	9.3 per cent.
$CO =$	5.6 volumes or	7.0 per cent.
$H_2 =$	2.0 volumes or	2.5 per cent.
$CH_4 =$	0.7 volumes or	0.9 per cent.
$N_2 =$	64.3 volumes or	80.3 per cent.
	80.0	100.0 per cent.

Now, in the above experiment the air-petrol ratio was 10.96, and from the test on the four-cycle engine the composition of the exhaust gases with this ratio was found to be as follows:

$CO_2 = 9.5$
$CO = 7.5$
$H_2 = 2.7$
$CH_4 = 0.9$
$N_2 = 79.4$
100.0

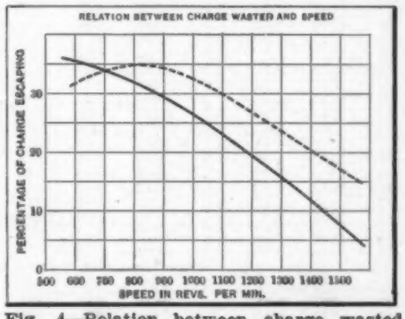
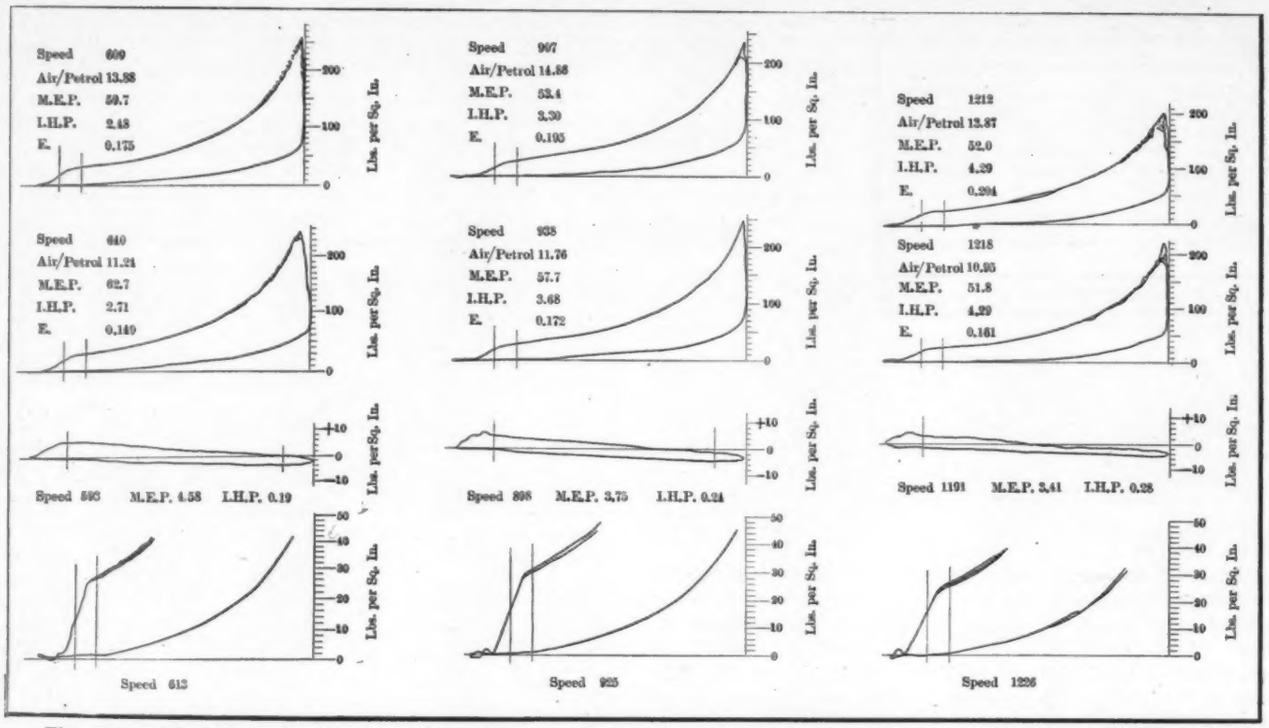


Fig. 4—Relation between charge wasted and speed

*"Proceedings Inst. A. E.," vol. 2, p. 101, 1908-9.



Figs. 5, 6 and 7—Diagrams at different speeds, showing power consumed in pumping in crankcase at different air-gasoline ratios

The agreement between these two results is a confirmation of the correctness of the deductions we have made with reference to the proportion of the charge which escapes in the case of the two-cycle engine. Although the agreement is not always quite as good as in the above example, yet results agree generally to within about half of 1 per cent.

TABLE I.—A. TESTS

Test No.	Speed (r.p.m.)	I.h.p.	B.h.p.	Lb. of petrol per 1,000 revs.	Lb. of petrol per i.h.p. hour	Thermal efficiency, gross	Thermal efficiency, net	M.e.p. lb. per sq. in.	Air / petrol by weight	Amount of charge which escapes, per cent.
1	636	2.71	2.1	.0651	.917	.149	.230	62.6	11.24	35
2	596	2.51	1.9	.0660	.941	.145	.226	61.8	11.48	36
3	638	2.73	2.1	.0592	.830	.165	.252	62.9	12.45	34
4	609	2.48	1.9	.0531	.784	.174	.268	59.7	13.88	..
5	601	2.35	1.7	.0493	.756	.181	.279	57.5	15.12	..
6	604	2.36	1.7	.0493	.758	.180	.278	57.3	15.18	..
7	897	3.51	2.8	.0650	.997	.137	..	57.5	9.86	..
8	903	3.60	2.8	.0612	.923	.148	.212	58.5	10.35	30
9	902	3.59	2.8	.0579	.873	.157	.217	58.5	10.91	28
10	898	3.55	2.8	.0579	.881	.155	..	58.0	11.05	..
11	938	3.68	2.9	.0520	.795	.172	.247	57.7	11.76	30
12	905	3.54	2.8	.0541	.831	.165	..	57.4	11.83	..
13	900	3.57	2.8	.0493	.746	.183	..	58.2	13.02	..
14	937	3.55	2.8	.0452	.716	.191	.270	55.6	13.57	..
15	907	3.30	2.5	.0425	.702	.195	.276	53.4	14.86	..
16	897	3.26	2.5	.0426	.703	.194	..	53.4	15.31	..
17	1209	4.12	3.1	.0564	.992	.138	.169	50.1	9.75	18
18	1206	4.23	3.3	.0561	.960	.143	.177	51.6	9.91	19
19	1199	4.34	3.4	.0567	.945	.145	.175	52.8	9.92	17
20	1218	4.29	3.3	.0498	.847	.161	.201	51.8	10.96	20
21	1212	4.29	3.3	.0396	.671	.204	.250	52.0	13.87	..
22	1210	3.77	2.8	.0333	.641	.213	.262	45.8	16.74	..
23	1218	3.79	2.8	.0331	.637	.215	.264	45.7	16.89	..
24	1504	4.85	3.6	.0449	.838	.163	.179	47.2	10.06	9
25	1514	4.71	3.4	.0428	.825	.166	.177	45.7	10.43	7
26	1510	4.75	3.5	.0424	.808	.169	..	46.2	10.68	..
27	1509	4.80	3.5	.0398	.751	.182	..	46.7	11.29	..
28	1502	4.94	3.7	.0392	.716	.191	.206	48.3	11.61	7
29	1500	4.80	3.5	.0375	.703	.195	.208	47.0	12.12	6
30	1509	4.77	3.5	.0369	.700	.195	..	46.5	12.18	..
31	1510	4.82	3.5	.0342	.643	.213	..	46.9	13.10	..
32	1510	4.82	3.5	.0327	.614	.223	..	47.0	13.71	..
33	1508	4.91	3.6	.0325	.598	.229	.247	47.9	13.98	..
34	1508	4.51	3.2	.0304	.610	.224	..	43.9	14.75	..
35	1501	4.52	3.3	.0307	.610	.224	..	44.3	14.85	..
				Throttle-valve partly closed						
36	639	2.25	..	.0486	.828	.165	.216	51.7	12.12	25
37	897	2.86	..	.0415	.781	.175	.187	46.9	11.27	6
38	896	2.89	..	.0416	.775	.177	.199	47.4	11.36	11
39	1208	3.55	..	.0339	.693	.197	.213	43.1	11.73	7
40	1510	3.65	..	.0269	.669	.204	.209	35.5	12.27	2

The manner in which the percentage of charge escaping varies with the speed is shown by the continuous curve in Fig. 4, and varies from 35 per cent. at 600 revolutions per minute down to 7 per cent. at 1,500 revolutions per minute.

5. **Results of the Tests.**—The results of the tests made at the four speeds, with the engine valve timing as adjusted by the makers, are summarized in Table I.

In addition to the table given above, a few examples of indicator diagrams are given in Figs. 5, 6, 7, 8. For each speed there are given two typical diagrams from the cylinder taken with a strong indicator spring. The top diagram is for an air-petrol ratio of about 14, *i. e.*, one for which there is no carbon monoxide in the exhaust, and the second diagram for an air-petrol ratio of about 11. The third diagram is obtained from the crankcase, and the bottom diagram is a weak spring diagram, by means of which the changes of pressure during exhaust and induction can be studied. The vertical lines on the diagrams represent the points of the stroke at which the different ports are uncovered.

The following points may be noted with reference to these diagrams:

Speed 600 revolutions per minute, Fig. 5. At this speed the pressure in the cylinder falls to atmospheric considerably before the end of the stroke, while the compression line starts at atmospheric pressure. In the diagram taken from the crankcase it will be seen that as the piston rises the pressure gradually falls to about 4 pounds per square inch below the atmospheric line, when the third port is uncovered by the lower edge of the piston. The pressure then rises owing to the influx of the fresh charge, but does not reach the atmospheric line till the piston has completed about one-fifth of its downward stroke. By the time the inlet port is uncovered the pressure in the crankcase has risen to about 6 pounds per square inch, and falls nearly to the atmospheric line by the time the piston reaches the bottom of its stroke.

Speed 900 revolutions per minute, Fig. 6. The pressure in the cylinder sinks to atmospheric some time before the end of the stroke, and owing to inertia of the gases in the exhaust pipe falls a little below the atmospheric line. This effect, which is partically noticeable at this speed, is probably due to a resonance effect depending on the particular length of exhaust pipe employed, and shows itself in some of the other measurements made.

The chief peculiarity noticeable in the crankcase diagram is due to the fact that when the inlet port is uncovered the pressure in the cylinder is higher than that in the crankcase, and hence some of the exhaust blows back into the crankcase, causing a hump on the diagram.

Speed 1,200 revolutions per minute, Fig. 7. In the crankcase there is not time, during the interval when communication with the carbureter is open, for sufficient fresh charge to enter and raise the pressure to atmospheric. In fact, the pressure does not reach atmospheric till the piston has completed half the downward stroke.

Speed 1,500 revolutions per minute, Fig. 8. The effects noted above are here slightly more accentuated; for example, the small amount by which the pressure in the crankcase rises due to inflow of fresh charge during the time the third port is open, and the rise in pressure due to blow back from the cylinder.

7. Discussion of Results.—The results given in the preceding table are best examined by means of the series of curves which follow. First, we have in Fig. 9 the relation between the volume of air drawn in through the carbureter and the volume swept out by the piston. The upper full-line curve gives the ratio of the total volume of air taken in by the engine to the stroke volume, and it will be observed that there is a fairly rapid decrease as the speed increases, so that at 1,500 revolutions per minute the air taken is only 38 per cent. of the stroke volume. If in place of considering the total volume of charge taken into the engine we only take account of the volume of charge which remains in the cylinder and takes part in the combustion. *i. e.*, if we deduct from the total air the air which escapes, we get the lower full-line curve given in Fig. 9. From this curve it will be seen that the volume of charge which remains in the cylinder, and which is actually burnt, varies much less with the speed, the decrease in the total quantity of air drawn into the engine being to a considerable extent counterbalanced by the decrease in the amount of charge which escapes.

Owing to the fact that the exhaust port is always open after the inlet port is closed, the pressure at the commencement of compression is very nearly the same as the pressure in the exhaust pipe, that is, it is practically constant. In the same way the compression pressure is between 62 and 65 pounds per square inch at all the speeds. It would thus appear that the heat transferred between the cylinder contents and the walls is not appreciably different over the range of speed 600 to 1,500 revolutions per minute.

The change in mean effective pressure with speed and richness of mixture is shown in Fig. 10. It will be observed, as in the case of the four-cycle engine previously tested, that except for weak mixtures, the mean effective pressure remains very nearly constant at any given speed whatever the richness of the mixture employed. The variation of mean effective pressure with speed in this engine is, however, very much more marked than in the case of the four-cycle engine. At first sight this is exactly what would be expected, on account of the short time available for the escape of the burnt charge and the introduction of the fresh charge, so that the quantity of charge which enters the cylinder gets less and less as the speed rises. When, however, the matter is looked into more carefully, and account is taken of the amount of the fresh charge which escapes, the problem appears more complicated. As far as the change in mean effective pressure is concerned, it is evident that what we have to consider is the way in which the volume of charge remaining in the cylinder (*i. e.*, after deducting the amount which escapes) alters with the speed. Now from the lower full-line curve in Fig. 9 it will be seen that the charge remaining in the cylinder at a speed of 600 revolutions per minute is to that at 1,500 revolutions per minute as 40.5 is to 35.2, or 1.15 to 1, and if the thermal losses in the cylinder were independent of the speed we should expect the mean effective pressure to bear the same ratio, while as a matter of fact the ratio obtained is about 1.33 to 1. It is difficult to account satisfactorily for this discrepancy. One explanation is that it is due to the comparatively slow burning of the charge in the engine, owing to the large proportion of products of combustion which is always present.* The effect of this

* The proportion of exhaust products to new charge is about twice as great in the case of the two-cycle engine as it is in the four-cycle engine. By determining the crank angle at which contact was made on the commutator and the interval which elapses with the particular coil employed between the closing of the primary circuit and the passage of a spark it was found that to obtain the best-shaped diagram at 1,500 revolutions per minute the spark had to pass, and hence the charge was fired at a crank angle of 30 degrees before the top of the stroke.

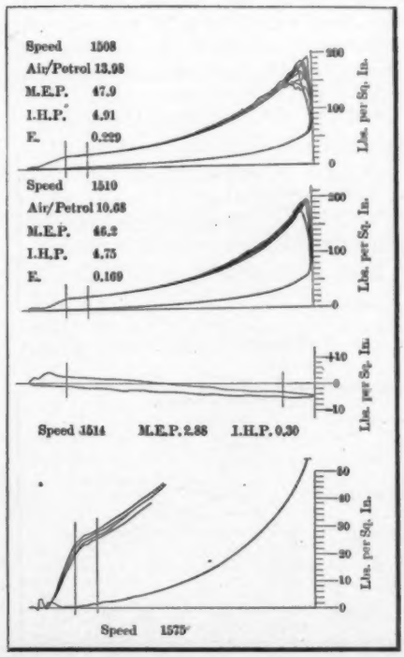


Fig. 8—Diagram taken at 1,500 revs. per minute

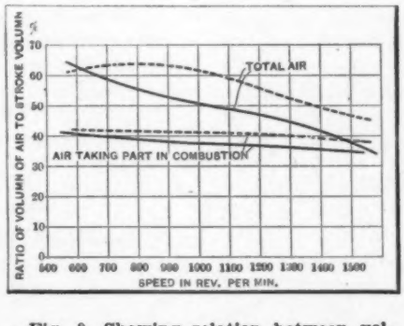


Fig. 9—Showing relation between volume of air taken in and volume swept out by piston

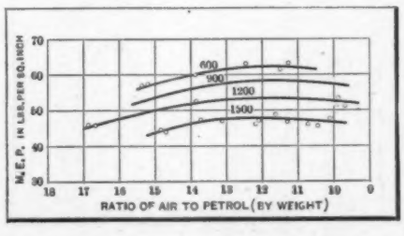


Fig. 10—Change in mean effective pressure with speed and richness of mixture

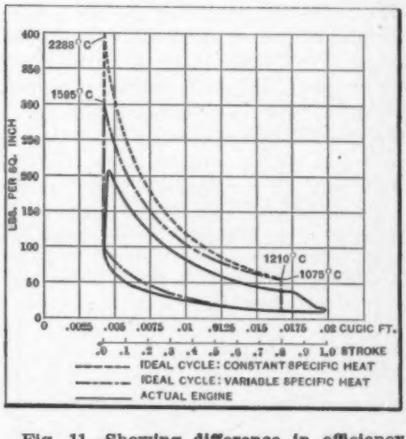


Fig. 11—Showing difference in efficiency under different conditions

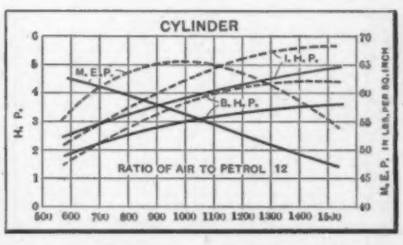


Fig. 12—Variation of I. H. P. with speed of motor in cylinder

slow burning will be more pronounced as the speed increases. Another explanation is that the proportion of charge which escapes has been over-estimated at slow speeds, or under-estimated at high speeds.

The manner in which the indicated horsepower for a constant richness of mixture (air-petrol = 12) varies with the speed is shown in the full-line curve in Figs. 12 and 15. The indicated horsepower given in these figures and in column 3 of Table I, is obtained from the area of the diagram given by the working cylinder only, no deduction having been made for the work done in compressing the charge in the crankcase. The amount of power expended in doing the pumping work in the crankcase is shown by the series of full-line curves in Fig. 15. It will be observed that it does not vary very much with the speed, and amounts to about 0.25 horsepower.

Although the investigation of the brake horsepower of the engine was not seriously considered, yet the indicated horsepower when the engine was run light was determined, and from these values approximate values for the brake horsepower at different speeds have been computed and are entered in column 4 of the table and are plotted in Figs. 12 and 15. It will be noticed that the brake horsepower does not increase much when the speed is raised above 1,200 revolutions.

8. Thermal Efficiency.—The thermal efficiency has been calculated on the indicated horsepower as defined above, taking into account the heat value of all the petrol supplied to the engine. The results are shown in the table and in Fig 13. The efficiency increases as the richness of mixture is reduced below the point at which complete combustion takes place—*i. e.*, for mixtures containing less than 1 of petrol to 14 of air. This result, while it agrees with those previously obtained in the case of the four-cycle engine, does not support Professor Hopkinson's values* from the engines he has tested, for he found that the efficiency was a maximum when there was just enough oxygen to give complete combustion (*i. e.*, air-petrol = 14).

The change in the efficiency, when the thermal value of all the fuel supplied is taken into account, or what for brevity may be called the gross thermal efficiency, with speed, is largely governed by the effect of loss of charge, and hence it is of interest to calculate what the efficiency would be supposing no loss of charge took place—*i. e.*, to obtain the net efficiency. This can at once be obtained from the numbers for the percentage loss at different speeds. The values for the net thermal efficiencies at the different speeds are given in Fig. 14, and it will be observed that the change with speed is not very great. The efficiency is higher at a speed of 900 revolutions per minute than at the other speeds, the lowest efficiency of all being at a speed of 1,500 revolutions per minute. It is of interest to note that the speed recommended by the makers for this engine is 900 revolutions per minute. The decrease of the efficiency at the higher speeds may be due to the slow combustion considered in Section 7, or to a wrong estimate of the amount of charge escaping. Owing to the agreement between the values for the composition of the exhaust gases, when corrected for the proportion of the charge escaping, with the values obtained in the case of the four-cycle engine, the authors do not think that errors in estimating the amount which escapes can account for the decrease of mean effective pressure and net efficiency at high speeds.

The difference between the gross and net thermal efficiencies at different speeds is brought out more clearly in Figs. 16-19. The curve marked A gives the gross efficiency for different air-petrol ratios, the curve B the net efficiency, while the curve C shows the values of the net efficiency if allowance is made not only for the escaping charge, but also for the thermal value of the combustible gases, carbon monoxide, hydrogen, and methane in the exhaust. The probable explanation of the rise in the curve C as the mixture gets richer has been given in the paper on the four-cycle engine. The correctness of the views there expressed receives support* from the calculation of the theoretical efficiency of an engine in which there are no thermal losses due to heat communicated to the cylinder walls, for in such a case it is found that taking into account the change in the specific heat of the gases, the efficiency rises as the mixture gets both richer and weaker than that for which there is complete combustion. Measurements have also shown that the temperature of the exhaust is a maximum for mixtures corresponding to complete combustion.

Since, in the case of the two-cycle engine, the combustion chamber is entirely free from valve pockets, and, in fact, its surface is almost the minimum possible for the given volume, it is of considerable interest to compare the actual efficiency attained with that which might be expected in the case of an ideal engine in which there were no thermal losses due to communication of heat to the walls of the cylinder. When making such a comparison the question as to the compression ratio to be adopted as that of the engine is rather doubtful. We have assumed that the actual compression ratio is the ratio of the volume of the cylinder up to the point at which the exhaust port is first uncovered, to the volume of the combustion space. The value obtained in this way is 3.92, while if the whole cylinder volume up to the out-center position of the piston were taken the value would be 4.67. The reason for adopting the value 3.92 when obtaining the efficiency of the ideal engine is that in the actual engine the work done on the piston during the time it has overrun the exhaust port is very small, and the compression portion of the cycle cannot start till this port is closed.

Two ideal efficiencies have been calculated. In one, the air cycle efficiency, the specific heat of the gases in the cylinder has

* "Proceedings Inst. A. E.," vol. iii, p. 220, 1908-09.

*See "Journal of Royal Society of Arts," vol. 58. p. 1002, 1910.

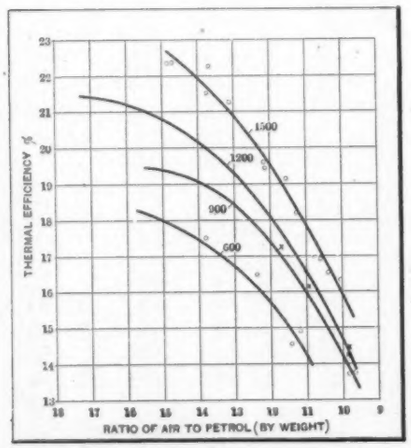


Fig. 13—Thermal efficiency calculated from I. H. P.

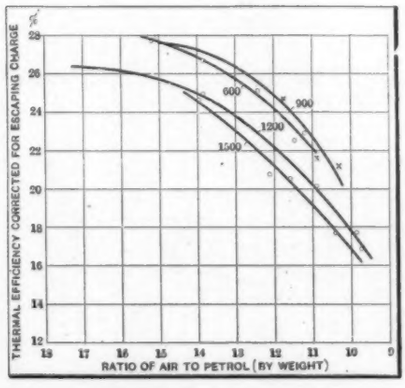


Fig. 14—Values for net thermal efficiencies at different speeds

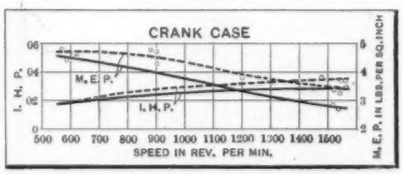


Fig. 15—Variation of I. H. P. with speed of motor in crankcase

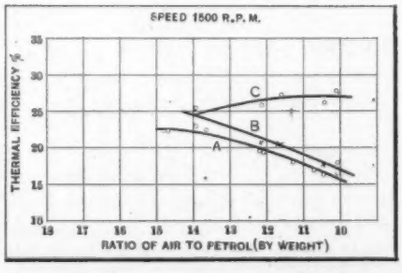


Fig. 16—Difference between net and gross thermal efficiency at 1,500 revs.

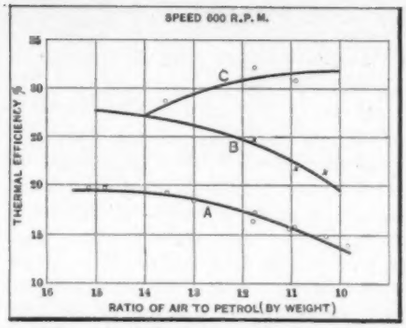


Fig. 17—Difference between net and gross thermal efficiency at 600 revolutions per minute.

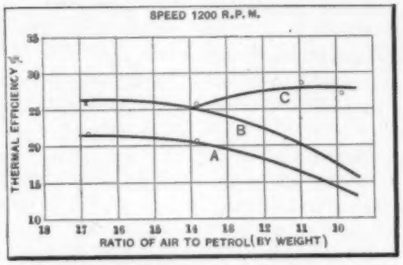


Fig. 19—Difference between net and gross thermal efficiency at 1,200 revolutions per minute.

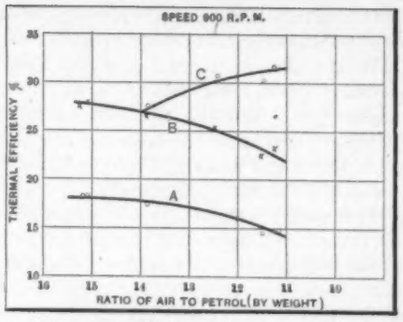


Fig. 18—Difference between net and gross thermal efficiency at 900 revolutions per minute.

Thermal efficiencies. A—gross thermal efficiency. B—Net thermal efficiency. C—Net thermal efficiency corrected for unburnt gasoline

been assumed to be constant and equal to the specific heat of air at ordinary temperatures. In the other, the specific heat of the gases has been taken as variable, the values being calculated from the tables given in the report of the British Association Committee on explosion temperatures,* in conjunction with the results of the exhaust gas analysis. The heat supply assumed in obtaining the ideal diagrams given in Fig. 11 is 453 foot-pounds per cycle, which corresponds to the heat actually liberated in the cylinder when the air-petrol ratio is 13.9 and the speed is 1,212 revolutions per minute. The larger of the dotted diagrams corresponds to the "air cycle," and the smaller to the ideal cycle with variable specific heat. The full-line diagram is an actual indicator diagram from the engine running under the given conditions.

The results are summarized in the following table, in which the values given for the actual indicator diagram under (e) are obtained when allowance has been made for the heat contained in the escaping charge, while under (b) no such allowance has been made, but the engine is debited with the thermal value of all the petrol supplied to the carbureter.

Allowing for the escaping charge, the relative efficiency attained on the assumption made as to the compression ratio amounts to 0.76. In the case of the four-cycle engine having a bore of 85 millimeters—the bore of the two-cycle engine being 82.5 millimeters—the relative efficiency was 0.77, so that apparently the smaller surface exposed to the hot gases in the two-cycle engine has not improved the efficiency, or, if it has done so, the effect has been masked by some other cause. The result supports the view expressed in the account of the previous experiments, that the thermal loss in these small engines does not vary to any great extent with the ratio of surface to volume of the combustion chamber.

The diagrams given in Fig. 11, Table II, shows the comparatively small increase in efficiency which it is possible to obtain, even if we entirely suppress all thermal losses due to communication of heat to the cylinder walls.

Effect on Engine of Altering Timing of Admission Port to Crank Case.—A consideration of the crank-case diagrams showed that at high speeds there was a very large amount of wire-drawing in the admission port to the crankcase and in the carbureter. To see what improvement in the power developed at high speeds would be obtained by lengthening the time the port was open, 1-8 inch was cut off the bottom edge of the piston opposite the port. In this way the port was open for 80 degrees of crank angle as against 70 degrees. The new valve diagram is shown in Fig. 2 (b).

The results obtained under the new conditions are given in Table III, and are shown on the figures by means of dotted curves.

Owing to the increased length of time during which the crankcase is in communication with the carbureter, it fills up better at all speeds except 600 revolutions per minute. At this low speed it is completely filled up with the previous setting, and hence the effect of keeping it open longer on the down stroke of the piston is to lessen the volume of charge retained in the crankcase. At the high speeds the increased volume of charge taken is quite marked, as is evident from a study of Fig. 9, while the proportion of charge escaping is also increased, see Fig. 4.

The effect on the indicated horsepower and brake horsepower is indicated by the dotted curves in Fig. 12. The effect of the change has been to decrease the indicated horsepower at 600 revolutions per minute by 8 per cent., and to increase the indicated horsepower at 900 revolutions per minute by 12 per cent., at 1,200 revolutions per minute by 21 per cent., and at 1,500 revolutions per minute by 19 per cent. The gross efficiency at the higher speeds is decreased owing to the increased loss of charge.

10. Comparison of Results Obtained with Two and Four-Cycle Engines.—When comparing the working of this two-cycle engine with an ordinary four-cycle engine it is to be noted that the range of mixture richness which it is possible to use is considerably smaller with the two-cycle than with the four-cycle, due to the very much larger admixture of exhaust products with the fresh charge. Unless the richness of mixture is adjusted within comparatively narrow limits, particularly at the high speeds, the engine refuses to work on the two-cycle, and only fires on every other out stroke, the intermediate stroke

*"British Association Report," Dublin, p. 316, 1908.

TABLE II.—TABLE RELATING TO INDICATOR DIAGRAMS, FIG. 11

Speed, 1,212 revs. per minute
Ratio of air to petrol (by weight), 13.87

	Thermal efficiency	M.e.p. in lbs. per sq. in.	Heat supply per cycle in ft.-lb.	Work in ft.-lb.	Heat to exhaust and jacket in ft.-lb.	Heat in unconsumed fuel	Relative efficiency
Ideal diagram—							
Constant specific heat...	42.1	106.9	453	191	262	..	..
Variable specific heat...	33.9	86.2	453	154	299	..	1.00
Actual engine							
(a).....	25.6	52.0	453	116	337	—	0.76
(b).....	20.3	52.0	573	116	337	120	0.60

TABLE III.—B. TESTS

Test No.	Speed (r.p.m.)	I.h.p.	B.h.p.	Lb. of petrol per 1,000 revs.	Lb. of petrol per i.h.p. hour	Thermal efficiency, gross	Thermal efficiency, net	M.e.p. lb. per sq. in.	Air / Petrol by Weight	Amount of charge which escapes, per cent.
41	601	2.34	1.71	.0710	1.093	.125	.184	57.2	10.28	32
42	606	2.46	1.83	.0723	1.078	.128	.191	59.7	10.33	33
43	602	2.30	1.67	.0679	1.065	.128	.190	56.1	10.61	33
44	604	2.34	1.71	.0586	0.910	.150	.214	56.8	12.37	30
45	922	4.11	3.34	.0698	0.940	.146	.221	65.5	10.75	34
46	1200	5.18	4.20	.0639	0.888	.154	.210	63.4	10.28	27
47	1502	5.74	4.64	.0537	0.841	.163	..	56.2	10.35	..
48	1506	5.44	4.16	.0457	0.760	.180	.218	53.0	12.13	17

acting as a scavenging stroke. The result of this peculiarity is that unless the carbureter provides a mixture of uniform richness at different speeds, and for different throttle openings, satisfactory working cannot be obtained. In the case of the engine under test the effective use of the carbureter jet was hand-adjusted in every case, but even then, at a speed of 1,500 revolutions per minute, it was often difficult to exactly hit off the correct mixture.

The easiest way of comparing the power developed with that of four-cycle engine of the same size is to take double the mean effective pressure, and compare this quantity with the mean effective pressure given by a four-cycle engine. In this way we get:

Speed (revs. per min.)	Piston speed (ft. per min.)	M.e.p. (lb. per sq. in.)	Twice m.e.p. (lb. per sq. in.)
600	324	57.4	115
900	487	65.5	131
1,200	648	63.4	127
1,500	810	55.4	111

It is thus evident that at the low piston speed at which this engine works the power developed compares quite favorably with that of a four-cycle engine working at approximately the same piston speed. Thus, in the case of the Siddeley engine tested by Professor Hopkinson and the Clement-Talbot engine tested by one of the authors we have:

Engine	Piston speed (ft. per minute)	M.e.p. (lb. per sq. in.)
Siddeley	450	89
Siddeley	790	88
Clement-Talbot	552	87
Clement-Talbot	868	87
Clement-Talbot	1,024	83

A further advantage of the two-cycle engine is that the maximum pressures attained are much lower. Thus, at a speed of 600 revolutions per minute the mean maximum pressure attained was 260 pounds per square inch gauge pressure. This fact is quite worth while keeping in mind in cases where extreme lightness is of the utmost importance, since the weight of an engine depends in a great measure on the maximum pressure which occurs in the cylinder. Of course, if the two-cycle engine fails to fire the charge on any stroke, the pressure reached on the next stroke is very much greater than the average. Thus, in the engine tested, after a misfire the pressure rose to over 360 pounds per square inch. Hence, if an engine on the two-cycle were designed for the low pressures which obtain when working on that principle, and if, for the sake of lightness, the parts were cut very fine, it would probably be necessary to provide a relief valve on the cylinder head to allow for the high pressure reached after an accidental miss-fire.

Questions That Arise

SOME OF THOSE THAT COME UP IN EVERY-DAY AUTOMOBILING ARE ANSWERED BY THE MATTER PRESENTED BY FORREST R. JONES IN THE NEW EDITION OF THE "AUTOMOBILE CATECHISM."

[349]—What is jump-spark, or high-tension ignition?

Ignition of the combustible charge in the motor cylinder by means of a spark of electricity which jumps across the space (spark-gap) between two pieces of metal which remain at a fixed distance apart while in use.

Sparks jump across the spark-gap in a series in some types of high-tension ignition systems; in others, only a single spark passes during the ignition of a charge. The single spark, as distinguished by a single snapping sound, is in reality made up of several sparks, or oscillations, following each other in extremely rapid succession.

[350]—What is make-and-break ignition, also called low-tension ignition and contact ignition?

Ignition of the charge in the motor cylinder by means of an electric arc (also called a spark) which is drawn between two metallic points as they are separated from contact with each other.

[351]—Describe one form of mechanically operated mechanism for low-tension (contact-arc, make-and-break) ignition.

A stationary metallic rod or bar extends through the wall of the combustion chamber into the combustion space of the motor, and is electrically insulated from the metal of the cylinder by mica, porcelain or steatite (soapstone). Another metallic part also extends into the cylinder, but is not electrically insulated from it. It has a running fit in the hole it fills, so that an arm attached to it inside the combustion chamber can be oscillated as a rocker arm both to bring it into contact with the insulated rod and to open the contact by the use of proper mechanism.

A spring is used outside the combustion chamber to hold the contact points together inside. When in operation the points are either kept closed most of the time or are brought together just before the time for ignition and an electric current from some source, such as a low-tension magneto or a battery, flows through them.

An igniter cam or other device is attached to some rotating part of the engine so as to rapidly separate the contact points at the instant a charge is to be fired in the cylinder. The separation of the points draws an electric arc which ignites the charge.

[352]—Describe a jump-spark igniter (high-tension spark-plug)?

The essential elements of the ordinary types are: An outer sleeve or shell of metal; a tubular part of insulating material such as porcelain, mica or steatite (soapstone), which fits into the outer sleeve; and a central metal rod or wire which fits in the hole through the insulating part.

The outer sleeve is threaded to screw into the cylinder casting of the motor in the common form of jump-spark plug.

The insulated central rod or wire terminates either near the outer metallic shell, or near a piece of metal attached to the shell, so as to leave a short spark-gap or air-gap at the plug-end which is inside the cumbustion space when the plug is in place in the motor.

[353]—What supplies electricity for automobile ignition?

Either a primary electric battery, a storage battery or a mechanically-driven electric generator.

[354]—What is a magneto?

A power-driven electric generator which has permanent magnets as an important part of its construction.

[355]—What is a dynamo (dynamo-electric machine)?

In the more general usage it is a power-driven electric generator whose magnets require an electric current to keep them magnetized.

[356]—What is an electro-magnet?

A magnetized piece of iron or soft (mild) steel whose magnetism depends on electric current flowing either around it or in other proper relation to it.

[357]—What is a direct electric current?

One which flows in only one direction. It may flow either continuously or intermittently.

[358]—What is an alternating electric current?

One which flows first in one direction, then reverses and flows in the opposite direction, and so on.

In ignition systems using alternating current there are generally as many, or more, reversals of current per second as revolutions of the motor crankshaft during the same time.

[359]—What is a timer for jump-spark ignition?

A mechanically-operated device for closing the primary circuit (battery circuit) of a trembler spark-coil so that a jump-spark is produced in the combustion chamber of the motor at the proper instant.

The most general use of a timer is as a part of a jump-spark ignition system in which current is supplied by a battery.

[360]—What is the general form of a timer?

In the more usual designs it consists of an outer casing of insulating material (hard rubber or wood fiber) with hollow cylindrical surface into which metallic contact pieces are set.

A central rotating part (the rotor) driven by the engine brings a metal arm or other suitable form of metal part into contact with the stationary contacts in the casing, thus completing the primary circuit through the timer. While many greatly different forms of timers are used their function is always the same.

[361]—Is the timer intended to produce an ignition spark in the motor at the instant the primary circuit is broken by the separation of the timer contacts?

Only in case the trembler of the spark-coil fails to operate, as when its contacts stick together on account of fusing or burning. A spark may be formed at the igniter when the timer contacts separate at the instant the trembler contacts are touching each other during the proper operation of the trembler.

[362]—How often should the timer close the primary circuit for each cylinder of a four-stroke cycle engine?

Once every two revolutions of the mainshaft (crankshaft) for each cylinder (every four strokes of each piston).

[363]—At what speed should a timer with a single rotating contact-arm or contact-point rotate in a four-stroke cycle engine?

Half as fast as the mainshaft (crankshaft). This is the same speed as that of the camshaft.

Where Rubber Tires Come From

TELLING THE STORY OF RUBBER PRODUCTION AND SETTING FORTH THE SEVERAL PROCESSES IN THE MAKING OF TIRES

ONE of the features of the A. L. A. M. show number of THE AUTOMOBILE, issued January 5, 1911, was an article entitled "The Reign of Rubber." The first installment of the article dealt with the growth of the giant industry comprised under the head of rubber production.

The article in question recounted the first uses of rubber, noting that the first bit seen in England was brought there in 1770 and was named rubber because it proved useful in erasing pencil marks. In 1823 sailors from the Amazon valley brought the first rubber shoes into the United States. In 1843 Goodyear vulcanized rubber. It was transplanted from the Amazon to Ceylon, and in 1898 scientific culture was instituted on a commercial basis. The world's production last year was 152,897,269 pounds. The record high price was touched in April, 1910, when rubber sold in the market at $3.12 a pound.

The field is being constantly enlarged for the production of cultivated rubber, but the chief source of supply is from the wild plants. The Philippines, Guianas and the German tropical possessions are being added to the field as well as the East Indies.

The earliest record of rubber traces back to 1730. In 1819 Charles MacIntosh, of Scotland, discovered that rubber was soluble in naphtha. The rubberized cloth used for raincoats was one result of his discovery. The practical use of rubber really began with the process of vulcanization which renders it more permanent in form and more applicable to commercial wants.

The world's supply of rubber to-day, exclusive of Guayule and Pontianac, is divided into three classes, namely, para, plantation and other sorts. Plantation rubber refers to the product of the Malay and Ceylon plantations, the trees producing a quality of rubber which is identical with para rubber. The price of the two kinds of rubber is identical. The price of all varieties of rubber is based on upriver fine Para, the term Para being used to designate the rubber that is gathered along the Amazon River and its tributaries from specimens of the tree known botanically as Hevea Brasiliensis.

The Congo and Mexico produce inferior grades of rubber, considerable guayule coming from the latter country.

The price of rubber is never based on uncertainty as to the outcome of the current year's crop. It can be estimated within one thousand tons.

There are 855,992 acres devoted to the plantation rubber industry in the whole of Malaysia, where 534 estates are maintained. The plantation rubber areas in Bartica, British Guiana, comprise 15,000 acres. The German colonies in Africa at the present time have about 2,500 acres planted in rubber.

The highest price to which rubber has mounted since it became a commercial commodity was $3.12 per pound, in April, 1910.

Under the influence of a sufficient output of plantation rubber, the price may be driven back to the basis of 1898 and 1903, respectively, when rubber was quoted from $1 to $1.25 per pound.

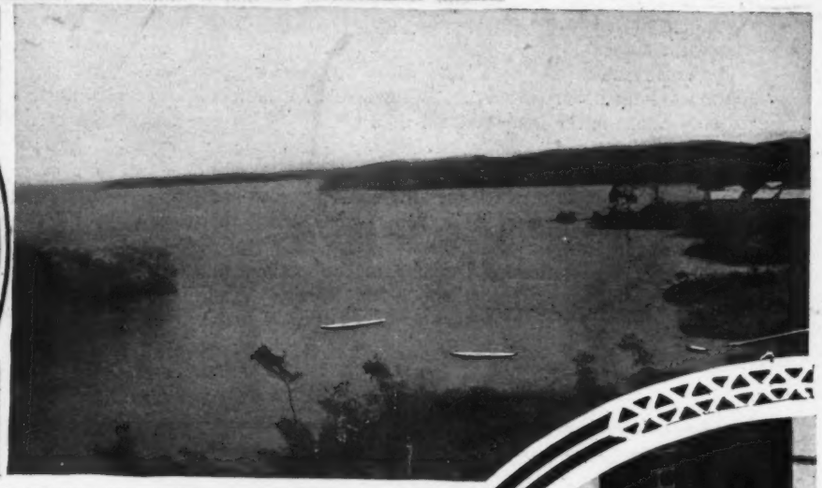
There is an export duty of 19 to 22 per cent. on rubber, aggregating something like twenty to forty cents per pound.

It costs about seventy-five cents per pound to deliver rubber in New York or London.

To embark in the industry of raising plantation rubber it is necessary, as in any other line of agricultural enterprise, to begin at the beginning. The first work to be accomplished is the clearing of the forest lands. The process is decidedly simpler than clearing for agricultural requirements. A directed corps of 300 to 400 skilled woodchoppers manage to do the work in a surprisingly short space of time. Except for the lopped branches, the felled trees are left to lie where they have fallen. The heat of the tropic sun dries the branches very quickly, and they are gathered together at various points in the clearing by the coolies and set on fire. The process of flame-clearing leaves the logs and stumps to gradual disintegration.

Experience has proven that in the next step relative to planting rubber time is gained by importing "stumps" and setting them out. In the case of planting from rubber seeds it is imperative that the seeds shall be developed in a nursery, and that the seedlings shall have nine months of growth, at which time they will be from one-half to three-forths of an inch in diameter. Upon the other hand, if the saplings are taken at any time before they are one year old and the roots be cut off and the top lopped, the "stick," upon being put into the ground, will root itself, and at the end of three months form a tree as vigorous as if it had grown where originally planted. These "sticks," which are about three feet long, are technically known as "stumps." When it is time to plant new areas of rubber the "stumps" are transported from the Malay States, as has been the case where the Para rubber plantation industry has been inaugurated in Sarawak, South Borneo, certain sections of British North Borneo, up from Bartica in British Guiana, on the Karimon Islands a short distance south of Singapore, etc. The trees having been planted, the chief future care required is to keep the land free from weeds until the trees shall have reached such a point that their shade will prevent the growth

Clearing for Rubber Planting



Mazaruni River,

Typical Rubber Plantation.

Ceylon Coolie Sorti

Rubber Plantation Bartica British Guiana.

Planting Rubber - Malay States.

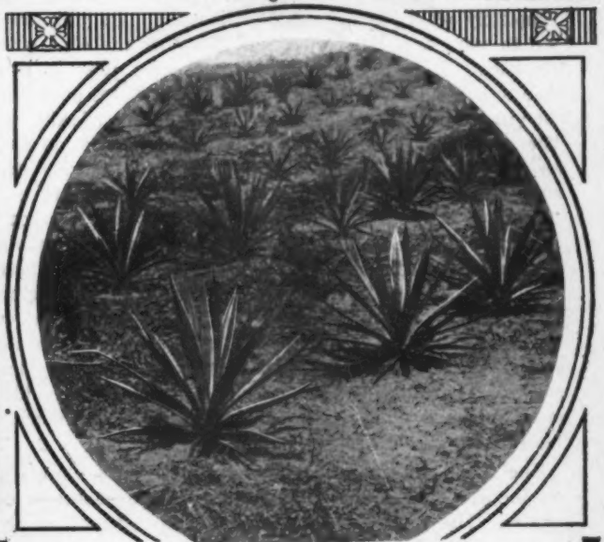
British Guiana

Coolie Depot Georgetown British Guiana

ng Para Rubber Seed

Rubber Germinating in Baskets.

Breakfast Hour Rubber Camp



Field of Sisal Plant.

of underbrush. If the ground is quickly covered with plants the growth of grass and underbrush will be prevented and the bother of weeding will be avoided. Throughout the districts where para rubber is being cultivated, and especially in British North Borneo, the hills of British Guiana and the Malay States, use is made of the sweet potato vine to prevent the coming up of weeds, and the system is proving a great success. Within a space of four months the vines form a thick mass, thoroughly covering the ground. It is the policy of the planters to let some of the potatoes remain in the ground, where they rot, thus constituting themselves into a splendid fertilizer to the soil, tne plants meantime continuing to develop and form a fine covering for the trees until they are old enough to tap. Within four years from the time of planting the "stump" the para tree reaches a circumference of 16 to 20 inches. A sandy loam is best suited to the successful growth of Hevea Brasiliensis, or para rubber. Rolling, elevated, loamy ground, at an altitude of from 10 to 150 feet above the river level, lends itself most profitably to the industry.

A few words relative to wild rubber, the forests occupying many thousands of acres, in many lands.

Until within the last dozen years, at the time the plantations began to yield in commercial quantities, all the rubber that supplied the market of the world was gathered laboriously in the Amazon River region from the tapping of trees that grow wild and scattered in the dense tropical forests. These rubber trees seldom grow in groups, but in a more or less isolated manner. In the vast forests of Brazil they average less than one tree to the acre. Consequently, the native rubber hunters, upon whom the trade has been dependent, make no exertion to find all of the trees, but they pitch their camps in sections of the forest where about five trees grow to the acre. It is often difficult to locate the rubber trees owing to the wide variety of timber-growth and the heavy brush with which the trees are not only surrounded but surmounted. A notable fact, and one peculiar to wild rubber, is that only those trees that are at least 15 years old are suitable for tapping—a difference signally in favor of the cultivated rubber trees.

It is necessary to cut paths through the thick jungle in order to reach the trees that have been located. Starting from the rude native camp, the narrow, tortuous paths twist and turn and zig-zag from tree to tree, and after a distance of miles have been covered the paths straggle back to the camp again. The work of keeping these paths open is very arduous. It is the custom of the tapper to literally fight his way through to the tree, and after he has tapped it he attaches a little cup in the cleft to catch the flow of latex. He then fights his way to the next tree and repeats his operation, finally reaching the camp completely played out through exhaustion. By this time he is due to start over the trail again to gather the cups containing the latex. It is a wearisome, time-wasting job. It is impossible to supervise this sort of work. The natives possess neither the virtue of scrupulousness nor the artisanship of skilled tappers. The consequence is that after they have passed on the trees resemble butchers' blocks on account of the hacking that they have received. Stones and other foreign ingredients, especially cocoanuts, are mixed with the rubber mass, or "barraca," as it is known. Sometimes it is necessary to transport provisions a distance of 1,000 miles up the river, and from here they have to be carried by hand to the camps. The adulteration of the "barraca" and the high cost of provisions has a tendency to run up the expense of gathering wild rubber five times greater per pound, in many cases, than the cost of gathering plantation rubber. That there is a falling off in the supply of wild rubber in the districts already opened up is evident, and much of the fault lies in ruthless tapping.

The flower of the rubber tree resembles very closely a blossoming sprig of catnip. The leaves of the rubber trees vary in size. The leaf of the sapling grows to a length of about 12 inches, 3 inches wide at the center, from which it tapers to a point at the stem and the tip. As the growth of the tree increases the leaf decreases in size, and by the time the tree is fully developed the leaves measure about 3 or 4 inches long and 1 1-2 inches wide. For this reason it is very difficult to identify forest trees, many of them growing to be 100 feet in height. Few people have any idea what the "seed" of the rubber tree looks like. It is a duplicate in appearance of the pecan nut, the only difference being that it is a bit more blunt at both ends, and it is mottled with black spots. The seed when planted germinates within a space of from three to four days. The soil required is a very carefully prepared, rich, sandy loam, which must be kept well drained, but at the same time receive moisture sufficient to keep the soil damp. Soil preparation is very essential. The ideal climatic condition for raising plantation rubber is 100 inches of rain per year; but the minimum of rain should not go below 20 inches.

The process of gathering the crude product of the rubber plantations is by collecting the milk or latex which flows from cuts made in the bark of the rubber trees. The process of coagulating follows: This is a very simple part of the work of getting the product into marketable shape. The caoutchouc, as the rubber element of the latex is known, is separated from the watery portion by containing the latex in shallow dishes, as demonstrated in the illustration. The latex, after rising to the top, very much after the manner in which cream rises on a pan of milk, is skimmed off and shaped into "biscuits" preparatory to being washed and packed for shipment. No expensive machinery is used.

To illustrate the point that the yield of rubber does not depend on the number of trees to the acre, reference may be made to two of the oldest plantations in the Malay States. One, on a basis of 150 acres, planted trees 10 by 10. The overcrowded condition of these trees caused the planters to thin them out until the number did not run more than 250 trees to the acre. This number was still found to be too many. The trees, tapped in their ninth year, yielded only 363 pounds per acre, or a little better than one and one-half pounds per tree. In another instance, on another plantation containing 16 acres, 80 trees, each tree in its ninth year, were planted 30 by 25, and a yield of seven pounds per tree, or 359 pounds per acre, was obtained. The result may serve as an object lesson: One planter placed his trees too close together to derive the proper value; while the other planter set out too few trees to the acre to earn the best results. But the fact remains that the yields per acre were alike in each case in the aggregate. In contrast with this condition, according to Mr. Parry, trees from seven to eight years old and planted 150 to the acre frequently yield from 500 to 800 pounds per acre.

Some of the planters in the early days declared that rubber trees needed shade. This theory has been upset by modern agriculturists. They assert that in the shaded forests of Brazil it requires from 15 to 20 years for a tree to reach an age when it may be tapped with profit, while the tree grown on cleared land, and with a sufficient interval to give it sun and air, and the amount of moisture naturally needed, is matured sufficient to tap at a much earlier age. Another fact has been learned, namely, that the latex is carried from the roots up the tree by a tissue which lies on the outer portion of the tree, this tissue being separated and absolutely independent from the portions which carry the sap for the nourishment and up-build of the tree. There was an old theory that successive tappings resulted in an injury to the tree. But the modern-day rubber planters of Borneo, British Guiana and the Malay States claim that the flow of latex is greatly increased by successive tappings. The government botanists who have been putting every phase of plantation rubber cultivation to the test say that even during the period when the trees are in flower and the seeds are maturing repeated tappings have no appreciable effect on the seeds, either in quantity or quality.

Practical experience has demonstrated that it is out of the question to allow the wild rubber trees to stand while the work of clearing for planting is going on. While at the first sug-

gestion it may seem like an act of vandalism to assassinate huge trees that are yielding great quantities of rubber, the matter resolves itself into a logical proposition—the only feasible way out of the woods, as it were. By going into the forest a few yards it is easy to see the enmeshed condition of the large trees. The vines are like ropes, their thickness varying from an inch to that of a man's leg. These vines twine about the branches and trunks as they sprawl over the trees. Foliage meets, branches cross and cling with desperate grasp, and the structural strength of the obstruction is equal to holding up any tree that may be felled. This makes the clearing of the ground surrounding para trees a damaging operation. Besides, trees lose their stability when left in the open field after clearing. They are not long in going into decay, and they fall upon the planted tracts, with serious damaging results. It is argued, therefore, that it is wise to tap to the utmost the trees growing upon land that is to be cleared for planting, clear the land up, plant it, and repeat the process year after year. The number of forest trees to the acre, no matter how large, should not have the effect of curtailing the number of plantation trees, as the latter should always be greater by many times than in the case of forest trees, the correct number of plantation trees being from 120 to 150 trees to the acre.

After all, statistics go to show that while Nature is a mother to the products of the ground, with the soil and the sun and the rain looking after every germ in the world of plants, it is still merely Nature, and, beyond a certain degree, literally a dependent Nature at that. While Nature supplies the principles of life which are the beginning of the growth and brawn of plantdom, the actual development still remains man's work, for it is his agricultural labor in the soil which assists Nature to bring forth her magnificent crops. When properly aided by man, Nature, being an amenable daughter, responds readily. Agricultural products are unlike the output of the manufacturer, which is the creation in some respect or other of man's inventive brain. Good farming has become a scientific trade, the farmer who carries the work on being a graduate of an agricultural school. He has his club in the agricultural association. The Agricultural Department in Washington has grown to the dignity of having a representative in the President's Cabinet. The Bureau of Manufactures, Department of Commerce and Labor, publishes daily reports from its consuls in all parts of the world, giving wide attention to the long strides that are being made by agriculturists—farmers who are giving Nature a hand. Extraordinary space and comment are devoted to the part that plantation rubber is playing in the industrial phases of the world. Now that the United States Government is interesting itself in the industry, 5,000 para rubber seeds having been transported from the Government Botanical Gardens in Singapore to the Philippines, the subject is getting near home. It will not be long before the North American Colonies will be in the march with other countries which are raising plantation rubber. Men who have given their best thoughts to this subject have found out that Nature is unable to supply the world's demand for rubber, the 1909 crop, omitting plantation rubber, having fallen 4,000 tons short of the 1905 production. These men have proven that the plantation rubber industry has most encouraging phases, as it readily lends itself to agricultural assistance.

Converting gum rubber from its raw state into an automobile tire is a process that occupies an important part in motoring. There are a dozen steps involved in this branch of manufacture, each of which must be taken with the utmost nicety and precision in order to attain the best results.

American tires are generally based upon that grade of crude rubber, known as pure Para, which is produced in the Amazon river valley in Brazil. This is delivered to the factories in semi-spherical bodies, weighing as much as 100 pounds each.

The first thing that is done to the crude rubber is to wash it thoroughly to remove foreign matter. This is accomplished by rolling it in machines fitted with warm rollers and bathing it in water. Its shape is changed materially during this process, which breaks up the original mass so that the bath will reach every part of the rubber. The washing usually removes from 1 to 4 per cent. of the bulk of the rubber and in the final stage of washing the mass is porous and sticky, looking strikingly like dark sponge. It is rolled out into thick, flat layers of spongy substance on the cylinders, when it is known to the tire-making trade as "crepe."

The effect of the washing is to remove not only the small sticks, stones, vegetable and animal impurities, but also to lighten the color of the rubber. This is because the action of the water and the rollers is to cleanse the rubber of some of the effects of the smoking that was given the gum in temporarily preparing it for market. The "crepe" is stored in masses, awaiting subsequent steps in the course of manufacture and while so stored soon darkens on the surface from the effects of the oxygen in the air until it is even more opaque and deeper in hue than it was upon being received.

The next step is to dry out a certain amount of the original moisture contained in the crude rubber and to remove the water introduced in the washing. This is done by evaporation and gentle pressure between warm rolls or in trays which are subjected to a moderate degree of heat.

The third step in the process of tire-making is to thoroughly masticate the washed and dried rubber in preparation for the addition of sulphur and other vulcanizing elements and to reduce it to a condition where it may be more readily handled in manufacture.

This is accomplished by converting the dried rubber into minute grains and shreds by means of friction rolls and mixing with it the sulphur and chemicals. The vulcanizing chemicals give the rubber a pale unhealthy color, which does not leave it until the final step in tire making has been finished. After being mixed, the mass is rolled out into sheets and still considered crude rubber, is called "mixed stock," on account of the addition of the chemicals.

The fifth step is the first actual progress that is made in the making of tires. The sheets of "mixed stock" are taken to the making room, where it is shaped into tires.

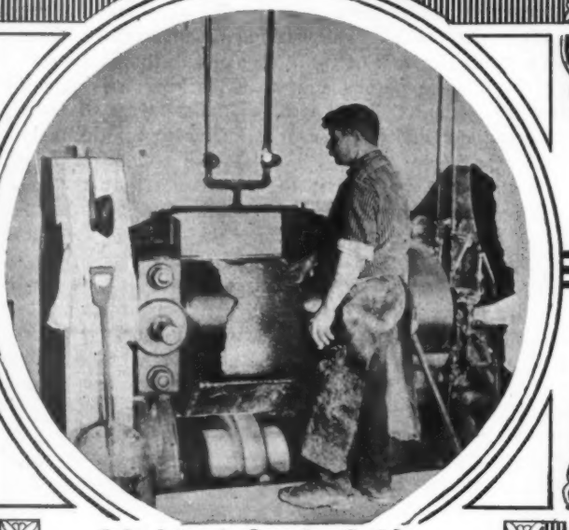
In preparing the rubber for its ultimate use the tire makers have been busy in the meantime in assembling cotton fabric of the heaviest and strongest kind of sea-island cotton. In the average tire the amount of this cotton cloth used varies from 25 to 33 per cent. and as the tires weigh when finished all the way from 10 to 35 pounds or more, the aggregate amount of cotton used figures out to an enormous total. In making the cloth ready for tire manufacture, the workmen cover the cloth with a layer of "mixed stock" and by means of rollers, associate the gum with the fabric with much completeness. This product is called "friction cloth."

The making of the tire then commences. In the room are many moulds made of iron, in the shape of the inside of a shoe. These are mounted so that they may be turned around with ease by the workmen. A foundation for the shoe is then laid. Next, a layer of the friction cloth is placed upon the shaper and cut to meet the various curves of the tire. On top of this another layer of cloth is placed, and another and another until the right degree of thickness has been attained. This varies from four to six plies of "friction cloth," depending upon style of tire to be made. Upon this strong shield of cloth and rubber a thick stratum of "mixed stock" is laid, and it in turn is covered with another ply of "friction cloth." Over and around this body the main portion of the tire is built.

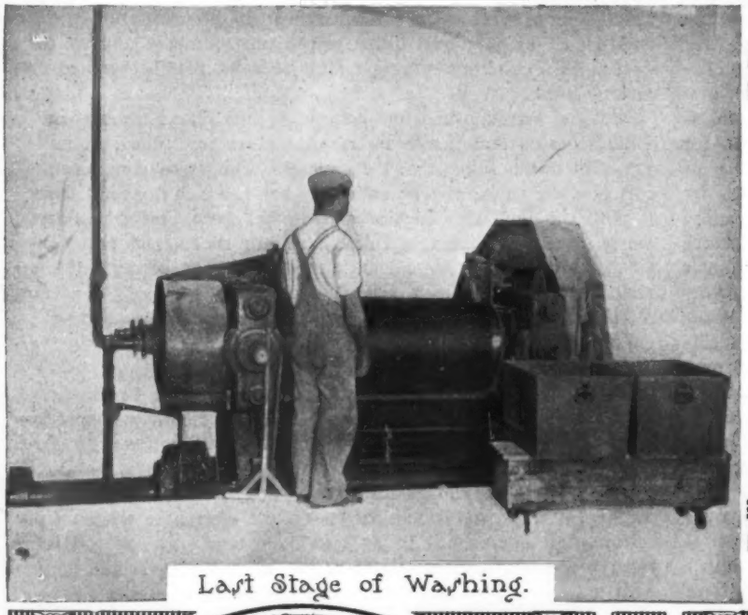
The surface may be made in any style desired, ranging all the way from perfectly smooth treads to corrugations and knobs and teeth to prevent slipping and skidding. In some varieties, the surface is specially treated with a preparation of zinc to gain hardness.

Vulcanizing, the keystone of the whole process, is the next step taken. In converting the "mixed stock" contained in the

Vulcan

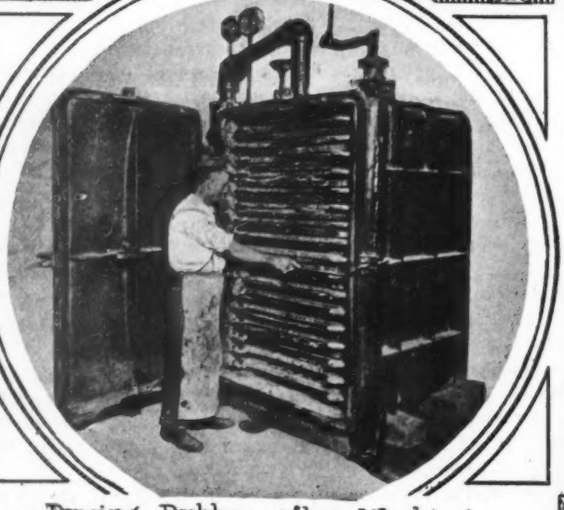


Washing Crude Rubber



Last Stage of Washing.

Pure Rub



Drying Rubber after Washing

Stretching Fabric on Tire Form.

izing

The Moulds

ber Washed

Putting on the Tire

Making Tubes.

Finishing the Tire.

finished tire to vulcanized rubber, quite a wide range of heat pressure and composition are used. The exact details vary with the factory and are guarded with much care by the officers.

The changes that are effected by vulcanizing are to make the finished product practically impervious to weather changes. While crude rubber freezes at 40 degrees Fahrenheit and melts at 120 degrees, the vulcanized shoe will only be affected by much lower and higher temperatures. The process also increases the elasticity and durability of the rubber.

The change is accomplished after the tires have been moulded and finally inspected. They are placed in the vulcanizing chambers and subjected to considerable heat, remaining certain lengths of time until the conversion of vulcanizing is complete.

Tire shoes, after being taken from the vulcanizers, will still melt if enough heat is applied, but it takes more than it did prior to the baking. They will also freeze, but it will only happen in very cold weather.

The process robs the rubber of its convertibility to a large extent, although the rubber in a discarded automobile shoe still has a mission as boot material after it has lost all value in its original field. It can never be revamped into automobile shoes that will grade up to the standard set by its first appearance in that line.

After the vulcanized tires have come from the furnaces they are subjected to another searching inspection, and about 2 per cent. are rejected for flaws, unevenness and other faults that could not be discovered earlier in manufacturing stages, or that have been developed by them.

Following this inspction the finished tires are given to workmen, who smooth off rough places with buffing wheels and by hand (Fig. 7). They are then classified according to size and grade and are given a final practical test, the pressure to which they are subjected being about 400 pounds to the square inch. As a general thing it may be said that a well-made tire, just from the factory, will withstand a pressure of 1,500 pounds to the square inch; but such pressures are rarely used, as they do not approximate working conditions.

The men who have charge of tire factories all emphasize the necessity of keeping the tires well inflated. They say that low air pressure is the most potent of all causes of blowouts, because the weight of the car in running over rough roads or turning corners is likely to press the tire into a wrinkle, breaking down the fabric of the inner tube, whereas if the tire had been properly inflated such a happening would have been extremely improbable.

After the pressure test the tires are sent to the stock room, ready for market.

The making of inner tubes is much simpler in every way than that of the shoes. The inner tubes are made of a single layer of high-grade rubber, and the manufacturing process used is largely mechanical.

Ball, Roller and Plain Bearings

DISCUSSING AND ILLUSTRATING THE VARIOUS TYPES OF BALL, ROLLER AND PLAIN BEARINGS, TOGETHER WITH THEIR APPLICATIONS IN AUTOMOBILE PRACTICE

WEAR and tear are copartners in the depreciation enterprise as it reacts against the unhappy tenant of the purse of the average automobilist, and a recount of the things that depreciate or wear out very quickly indicates that the major portion of the troublesome tendency hovers around the joints of the members. If the material is poor, or if the unit stresses are too high, members are likely to break at some point in their sections, but this is a class of trouble that can be overcome at no greater cost than is represented by the replacement of the poorly designed member by one which has been strengthened or had its shape altered, perhaps employing better material in the new part.

In addition to the wearing out at the joints, there is the question of noise which creeps in long before the "shape" becomes excessive, and it is this gradual swelling of noise that indicates to the automobilist that his car is giving way under the constant hammer blows of service. It is generally understood that a machine should operate in substantially continuous service, with a depreciation of say 10 per cent., with the understanding that if the depreciation extends beyond this amount it is because the design is imperfect, thus leaving room for the application of some thought on the part of men who are accustomed to dealing with serious problems.

In automobile work there are a plurality of problems which are mostly confined to the bearings of the various kinds, and for the sake of clearness here, it will be proper to classify the various types of joints, preliminary to discussing their details.

Various Types of Joints in Automobiles

(A) Sliding contact as between the piston and the cylinder walls.

(B) Oscillating contact as between the gudgeon pin and the connecting rod end.

(C) Plain bearing work with variable pressure as between the connecting rod journal and the crank pin.

(D) Plain bearing work at a constant pressure as between the telescoping members in the transmission gear case.

(E) Ball bearing work in the radial plain as between the gear spindles and the housing.

(F) Ball bearing work involving radial and thrust loads as in the housing of the bevel drive, floating the bevel gear spindle.

(G) Taper roller bearing work involving thrust and radial loads as in the front wheel hub.

(H) The combination use of annular-type ball bearings and thrust ball bearings for radial and thrust loads as in the front wheels of the automobile.

(I) The combination use of annular and roller bearings in live rear axles in view of space restrictions.

(J) The combination use of annular and taper roller bearings in live rear axles and other places to handle annular and radial loads and conform to space conditions.

(K) The combination use of anti-friction and plain bearings in crankshafts and other places.

The above schedule, which is based upon examples that may be seen at every hand in practice, would seem to indicate that all the types of bearings are being used for the various classes of work, so that the question of a choice is limited to commercial considerations of one character or another, without in any way reflecting upon the ability of the respective types of bearings to do the allotted work. As an illustration of abstract ability of bearings in general, it is only necessary to refer to crankshaft work and to point out that over 90 per cent. of all the motors made have their crankshafts floating on plain bearings, and this, to the man of no experience, would be a sufficient indication of the fact that there is some defect in the other types of bearings or that they would be in more general use. But the history of crankshaft work and the use of ball bearings therein is conclusive in its proof of the fact that ball bearing crankshafts are eminently satisfactory in every way.

Expediency in nine cases out of ten is the criterion. Ignorance has a representative on the ground, and exclusiveness is an ever-present factor. Expediency has two phases, one of which has to do with the type of design and the space afforded in a given unit, and the other is confined to the questions of first cost. There is the temporary expedient which is adequately represented in the type of design which does not permit of the use of a sufficiently large bearing of a given type and the designer compromises himself, as he thinks, but in fact he compromises the user. It is, of course, the representative of ignorance who compromises anyone. It cannot be shown either by reasoning or bookkeeping that there is a dividend to be collected as the result of the exploitation of an automobile in which the bearings have been made too small to do the work or used because they are of low first cost, putting a question mark on their life in the particular service.

It is the fair claim of the makers of automobiles that they select bearings on a conservative basis and quite a number of them maintain that it is not a good idea to use some one make of bearings throughout the product. In these days when bearings are made by companies devoted to this class of work to the exclusion of everything else, it is self-evident that they are experts in their line and that they should be able to turn out the very best workmanship from the most satisfactory selections of material and to express a wise opinion as to how the bearings should be employed. The makers of automobiles, however, since they would have to rely upon the makers of bearings for that part of their product, unless they build bearings themselves, which they do not as a rule, are disinclined to rely wholly upon some one maker of bearings for the entire product for, as they say, it is like putting all of their eggs in one basket, and who knows, the basket might be dropped; in other words, the burning down of the plant of the ball bearing maker or some other like catastrophe, ending in the shutting down of the automobile plant and the suffering of great loss for want of a few ball bearings.

In the early days of the building of automobiles this problem was a most serious one and quite a number of the makers of cars then confined their choice to some one type of ball or roller bearing throughout their product, this being the lesser of the evils. In the course of events the several makers of ball bearings arrived at the conclusion that their sizes should be interchangeable, and by common consent, or spontaneously, a standard was established and it is this standard as it obtains at the present time which permits makers of automobiles to select and use any of the several generic types of ball and roller bearings.

In the early days of the automobile industry plain bearing problems were acute, due to the use of inferior bearing brass and babbitt metal, and to the fact that the radial thicknesses of the bearing walls were in excess of that which after practice indicated was in keeping with the characteristics of metal and the service conditions. It was soon found that, if the walls were thick and the pressures somewhat high or variable, the hammer blows produced precisely the same effect as that which obtains when a pein hammer is employed to pein out a piece of metal, or when a spinner takes a flat sheet of metal and fashions it into a bell.

To overcome this deformation tendency, designers of automobiles resorted to the use of very thin walled bearings, frequently using backers of bearing bronze and a thin lining of a high-class white metal. Still another practice involves the use of die castings of white metal, and the probabilities are that this particular method of fashioning bearings has the greatest vogue in connection with crankshaft work at the present time.

Bearing metal has been the subject of a vast amount of investigation in the past, and unfortunately, foundry men have made thousands of indiscriminate mixtures, basing their practice upon pound price rather than from the point of view of the "eutectic"; moreover, the physical characteristics of the metal were too frequently disregarded. The Society of Automobile Engineers recognizing the necessity of a standard plain bearing metal has made this the subject of extended investigation on the part of a committee of its most expert members, and one of its most important recommendations is that virgin metal be employed in every important instance, whereas the babbitt metal of the wide market is generally a reclaimed product, with no chance of its being pure, and too frequently the main components are divergent from the claim for chemical analysis.

Babbitt metal is supposed to contain about 89 per cent. of tin, 7 per cent. of antimony and 4 per cent. of copper. The mere presence of these components, even in the proportions as given, is insufficient to assure a good bearing product, due to the fact that the lay of the grain will differ, depending upon whether or not the product is from virgin metal or from scrap. It is not nearly so important to hold to the exact stated composition if virgin metal is used, as it is to exclude reclaimed copper, tin and antimony.

Still another babbitt metal which is used to considerable extent holds 84 per cent. of tin, 9 per cent. of antimony, and 7 per cent. of copper, subject to not over 2 per cent. variation in the tin and limiting the variation in the antimony to about 1 per cent. White metal is made up of substantially 70 per cent. of tin, approximately 25 per cent. of zinc, limiting lead to 1 per cent., and the balance being copper. In this will be found a combination of elements with such complex relations that if

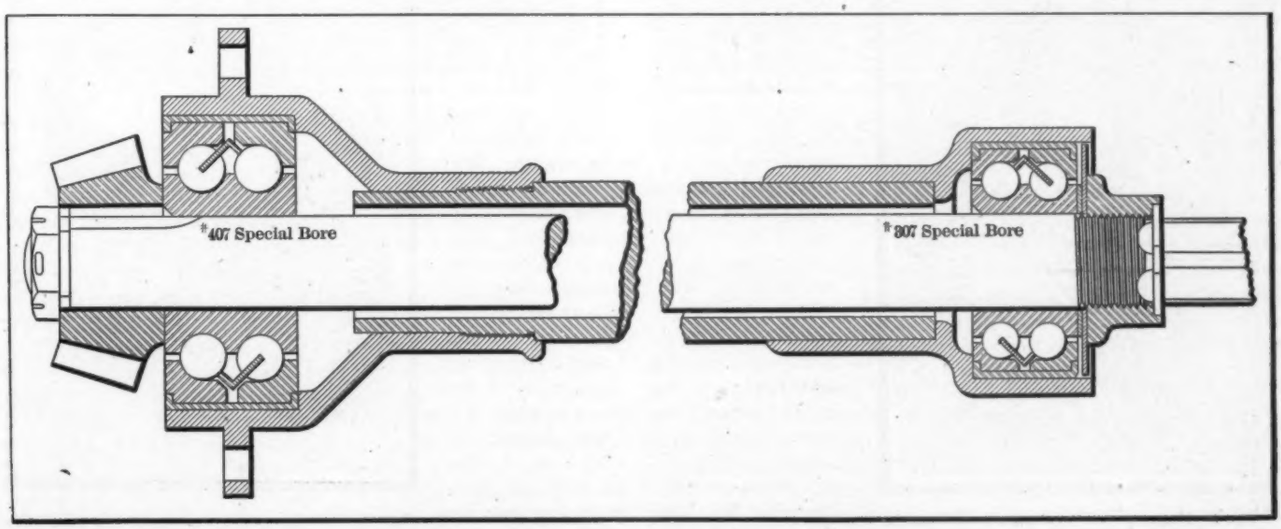


Fig. 1—Application of the "two-in-one" type of annular ball bearing as made by the New Departure Ball Bearing Company

virgin metal is not used, or if the mixture is not properly regulated, the results will be distinctly bad. Some of the poor work under such conditions will be due to the character of the metal of the spindle; in other words, in selecting material for journals choice should be influenced by the character of the material of the spindle.

But if the problem involved in the making of babbitt and white metal plain bearings is one that requires care and discrimination, it is child's play when confronted by the intricacies attending the casting of bearings from phosphor bronze and like products. In the production of the homogeneous alloy for bearing purposes the use of 80 per cent. of virgin copper with 10 per cent. of block tin, 9.5 per cent. of lead and 0.50 per cent. of phosphor bronze, is regarded as good practice, but there are four chances for serious error, even when virgin metal is employed and there is the added difficulty due to the practical impossibility of barring out impurities.

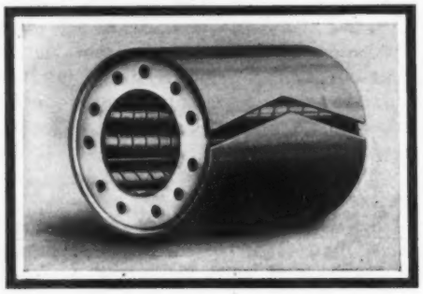


Fig. 2—Showing the split-shell Hyatt roller bearing

The automobile engineer who elects to use bronze for plain bearing work is ever confronted by the possibility that the foundryman will give him a mixture which is lower in tin than that as above stated, hoping, perchance, to be paid for the better product, knowing full well that a fairly good bearing brass can be produced from the use of about 85 per cent. of copper, 5 per cent. of tin, an equal content of lead and an equal increment of zinc. That the bearings so made will be fit for use in automobile work, it is not believed, nor can it be claimed that they would even be serviceable as backers for a white lining.

In some of the very best crankshaft bearings it is the practice to employ backers of the finest bearing bronze and to face them with a copper and tin composition, in which the proportion of copper to tin is in the ratio of substantially 10 to 90. The 90 per cent. tin content should, of course, be of the best block tin and the copper should be of virgin metal; moreover, the impurities should be distinctly limited. Metal such as this must be handled by men of skill in the plant where bearings are made and trouble oftentimes creeps in, due to the fact that the copper tin alloy is not heated to a red heat before pouring. Babbitt metal, and in fact all of the tri-alloys, work at quite low heats, but the dual-alloy, involving copper and tin, must be worked at a red heat. It is believed that the discussion of details of this character will be beneficial to a degree, since it will bring the users of automobiles to a realization of the fact that a problem resides in every detail of design and construction of cars, and that the automobiles which are making favorable records are so contrived in the light of satisfied detail that the factor of depreciation is maintained within commercial limits. Moreover, it being the case that every automobile must be repaired in the course of time, it remains to observe that the repairing operations must be done in such a way as to satisfy the very problems that come up in the building of cars. If it is necessary to handle bearing metal in a certain way during the manufacture of an automobile, the same necessity arises during the repairing of the car.

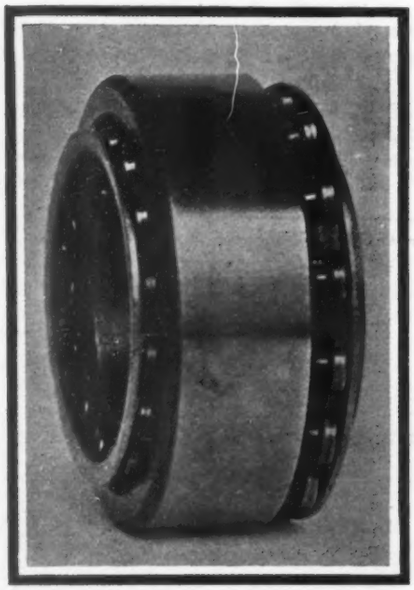


Fig. 3—Example of Timken roller bearing for automobile work

In some of the earlier types of automobiles many of the unimportant (so-called) bearings were lined with yellow brass, on the assumption that this relatively inexpensive metal would suffice for the purpose. This product is composed of from 62 to 65 per cent. of copper, 2 to 4 per cent. of lead, and from 36 down to 31 per cent. of zinc. The higher the zinc content the lower the pound price of the metal. Noise, as it is traced to "shape" in bearings, should be a pronounced factor at a very early moment in the life of a car if it has metal of this character, as the buffer at the joints of the relating members, and one of the most efficacious ways of extracting noise from cars lies in the replacement of these poor bearings with those of a superior mixture; moreover, the cost of replacement will be more than made up in the continued life and better service that will be realized.

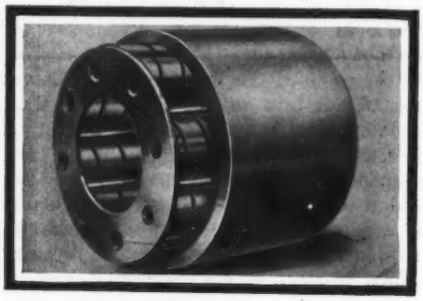


Fig. 4—Hyatt roller bearing for automobile work

Extended Use of Anti-friction Types of Bearings

Originally, when it was found that plain bearings were prone to melt out or "freeze," two schools of designers took sides in debate, the first of which championed the use of a better type of lubricant than could be had in the ordinary way and of superior means of feeding the lubricant to the bearings. The second school maintained that an ounce of prevention was worth a pound of cure, and they went in for anti-friction types of bearings, they understanding, of course, that in proportion as friction is reduced, heating effects will fall away, and in the absence of any friction at all there will be no heating at all. There is another school of designers whose ideas are along lines involving the con-

Fig. 5—Timken roller bearing showing the parts

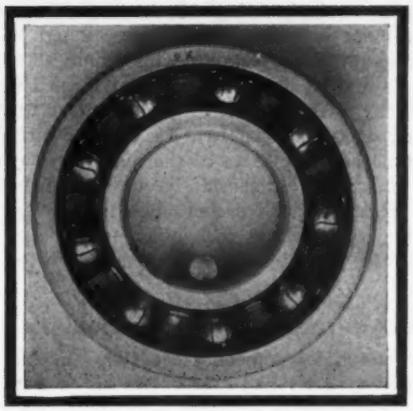


Fig. 6—Hess-Bright annular ball bearing

servation of energy; that is to say, the designers who study economy of the transmission of power and who go in for a higher mechanical efficiency. This type of designer would choose a plain bearing in preference to an anti-friction type were he able to show that the power consumed in the plain bearing would be less than the power consumed in a ball or roller bearing in a given example. To this type of designer the question of the allowable extent of abuse in the hands of poorly informed users would weigh but little; he would say, the user must pay for his shortcomings and experience will teach him the necessity for exercising a sufficient measure of care to absorb bearing trouble, whereas the designers who expressed a preference for anti-friction types of bearings had in mind the fact that an automobile becomes more valuable in proportion as it will continue to serve its purpose, despite the bad influence due to the high disregard of the care necessities on the part of men through indifference or ignorance, as the case may be.

There was a time when it was contended that ball and roller types of bearings would survive in service in the absence of lubrication. It was then supposed that the lubricating problem was limited to a single consideration. The effect of the presence of foreign matter on the unlubricated surfaces of the balls or rollers in the raceways was not taken into account, but experience with sprocket chains soon showed that a coating of good lubricating oil would float foreign matter in its body and the ill effect of its presence would be less marked if not entirely eliminated. In the course of time the makers of anti-friction types of bearings found it desirable to recommend that a lubricant be employed in connection with the use of their wares, but in some of the earlier efforts it was found that some grades of lubricant did more harm than good, due to the etching propensity of the ever-present acid content, which is a marked characteristic of certain classes of oils and greases. It became necessary, under the circumstances, to caution users of automobiles against the indiscriminate use of lubricating mediums and to pay particular attention to the acid question, avoiding the use of either an acid-bearing lubricating product, or the class of fats that are prone to an acid reaction, either due to the action of light, on account of atmospheric influences, or if they become rancid.

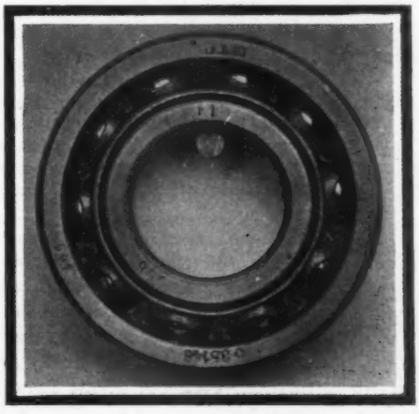


Fig. 7—S. R. O. type of annular ball bearing for automobile work

For a long time engineers and physicists maintained that it was the duty of the lubricating medium to serve as the buffer between the journal and the bearing. It was their idea that the lubricating medium was composed of a large number of globules of fat, floating in a mother liquor. This theory might be described in another way; the globules of fat might be regarded as balls and the mother liquor might then be looked upon as the retainer. This is a sufficiently lucid theory to be regarded as stable, but the old idea that the mother liquor need not be of any particular quality was fallacious. As a matter of fact, the mother liquor is the retainer for the so-called balls, and since they are scattered in the pressure zone, unless the mother liquor is capable of retaining them, the bearing will be let down upon the journal, and the condition called "freezing" will obtain. The mother liquor then must possess the quality of elasticity to a high degree, in which event the action is quite different from that as above anticipated, and instead of the fat globules being scattered away from the zone of pressure, they will be flattened down, but they will hold to relative position in the mother liquor and the bearing will be separated from the journal by the thickness of the film, however thin it will become in response to pressure.

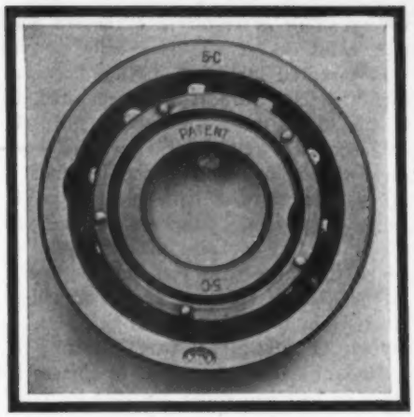


Fig. 8—R. I. V. type of annular ball bearing

The plain bearing problem, in the light of modern practice, makes the bearing, so-called, and the journal the mere retainers for a lubricating medium, so-called, but the latter is the agent which performs the rigorous service and it must have in its make-up the ability to form an unbroken film of varying thickness. This lubricant is sheared through its section, due to the fact that it adheres to the surfaces with a tenacity that exceeds the work done in the shearing of its section. It is on this account that a lubricating product fails in service the instant it is diluted with kerosene oil or gasoline, and even a drop of water will suffice to puncture the film and destroy its continuity.

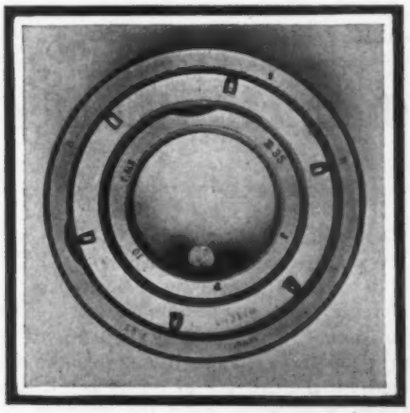


Fig. 9—F. & S. type of annular ball bearing for automobile work

Principle of the Ball Bearing Resides in the Lubricating Oil

From what has been said it should be readily understood that the principle of the ball bearing is a nature-made idea and that a good lubricant for a plain bearing is nothing more or less than a vast number of minutely dimensioned balls, they being composed of fat, tied together by a mother liquor which is capable of maintaining the distance relation of the globules, notwithstanding the variations in shapes and the distorting effects of pressure. It was but a step from the nature-made ball bearing, as it is represented by suitable grades of lubri-

cating oil, to a regularly organized system of balls, retainers and raceways, using steel balls of uniform size and hard, close-textured materials, rolling between raceway members on highly polished tracks and separated from each other either by the forces that reside within themselves or through the use of mechanical retainers. It was a very excellent idea to continue to employ nature's ball bearings, as they reside in fats, in conjunction with ball bearings as they are made by men, and a very good conception of the whole situation is one in which the fat globules make up the series of little balls on which the large balls roll and the energy consumed is limited to the amount required in the shearing of the section of the mother liquor between adjacent points of contact to whatever extent the balls depart from the state of rolling.

The illustrations, as used in this article, are of the various types of ball and roller bearings employed in automobile work, with a sufficient number of examples to show how the bearings may be utilized to the best advantage, taking into account the fact that a suitable housing will not only hold the races tightly in their proper positions, but will exclude foreign matter so that the principle of the grinding machine will not be incorporated into the system. The problems involved have been worked out in the various plants to a fitting extent and the makers of ball bearings have lent their co-operation to the good of the service, but there still remains an enormous problem to be solved, owing to the fact that the users of automobiles must sooner or later subject them to the tender mercies of repairmen, and if it takes the combined effort of the makers of the automobiles and the makers of ball bearings to solve the great main problem it stands to reason that a surfeit of lack of knowledge and indifference applied during the repairing operations should produce much of dissatisfaction, but nothing more.

Fig. 1 shows an annular type ball bearing on the end of a shaft fetching up against a shoulder and a nut is screwed on to the reduced extremity until the wing of the nut presses against the face of the inner raceway, thus clamping it tightly into place and preventing raceway rotation. This would seem like a simple thing to do and yet it is the source of much annoyance and some cost, due to the fact that a parallel fit on the shaft, if it is to be so close that the shaft will back up the raceway, and at the same time have the faces of the inner raceway parallel, the character of the workmanship required will be up to the limit of an artisan of skill even though he may be provided with a grinding machine and such other facilities as are in common use in the majority of automobile plants at the present time.

Limits of Tolerance Should Be Closely Held To

Admitting that the makers of automobiles are fully alive to the necessity of adhering to close limits of tolerance, assuming also that machine tool equipment employed is up to date and efficacious for the respective purposes, the fact remains that this splendid means for accuracy in the manufacture of automobiles has its disconcerting element, due to the lack of facilities and the absence of equal care during the repairing operations.

In fixing the limits of tolerance in automobile work, whether in the original building of the cars or in the after repairing operations, account must be taken of the fact that the variations within limits must be made more or less depending upon the diameter of the work, and the variations must also take into account the presence of a taper, if taper fits are employed, or be regulated to suit parallel work when it is sanctioned. It is fitting that this question of tolerance limits should be discussed in connection with the fitting of ball and roller bearings in order that the mounting thereof will be in keeping with their relatively high cost per pound or per unit, and with the fact that the questions of noise are now being given a vast amount of attention and that noiseless performance is only to be had when the workmanship and designing are substantially perfect.

What the Motor Builder Must Do

GRANTING THAT ALL EFFORTS FOR STANDARDIZATION ARE TIMELY, IT REMAINS TO BUILD A FOUNDATION IF THE STRUCTURE IS TO BE STABLE

STANDARDIZATION as a publicity "stunt" is attractive, but in turning over a new leaf at the beginning of 1911 quite a number of those who dealt in publicity are expressing a strong preference for a substitution of facts. Take this question of standardization; who will deny the needs of the motor? But how can a motor be standardized when the fuel upon which it must feed for the delivery of power is the most varying of all the things that come under the hand of the automobile engineer? The uncertainties of gasoline, or better yet, hydrocarbon products, were fittingly displayed in the paper which was read by F. H. Floyd, associate of the Society of Automobile Engineers, at the meeting which was held in New York City, January 11-12, 1911. In this paper, the source of supply of hydrocarbon products was traced from the initial output of 2,000 barrels in 1859 to 10,584,453 in 1908, and it was shown how the "crude" may be distilled fractionally for the production of gasoline without strict adherence to a standard. What the article failed to bring out was any evidence of the desire on the part of the distillers of "crude" to work to a standard, and those who have had to do with the running of automobiles are unable to appreciate the presence of a standard, if there is one, but they have ample evidence of a considerable variation in the working characteristics of "automobile gasoline," so that the apt way that Mr. Floyd brought out the opportunity of variation in the distilling process may have been taken advantage of by the distillers to the fullest extent.

It will doubtless be understood that the establishing of a standard in the production of automobile gasoline is not the easiest thing to do, otherwise it would have been brought about long ago. One reason why it would be extremely difficult to standardize this type of fuel is due to the fact that "crude" does not produce the same results chemically or physically from successive distillations even out of the same well, and the product of the fractional process from "crude" gathered in districts remote from each other is so variable in color, gravity and composition that it would tax the ingenuity of veterans in this art to unify the products.

The requirement of fuel as used in automobile motors is exacting and the relations are complex. The fuel must not only be volatile, but it is important that the viscosity, vapor-tension, calorific, and the ratio of carbon to hydrogen be maintained between reasonably narrow limits, otherwise attempts at standardizing motors will be for nought. There is much confusion in the array of matter having influence upon the use of hydrocarbon liquids in internal combustion motors, it being the case that the fuel may have volatility, and yet it might "crack" in the combustion chamber, precipitating a shower of carbon, and the consequent ills, or the fuel might be lacking in volatility so that it would enter the combustion chamber in liquid form, in which state the oxygen content would fail to reach a considerable portion of it, and the thermal efficiency of the motor would then be relatively low. According to F. H.

Floyd, the specifications of the various "fractions" are as follows:

SPECIFICATIONS OF THE VARIOUS FRACTIONS

Fuel	Specific gravity	Calorific value per pound	Weight per gal.	Calorific value per gal.	Carload price F.O.B. Detroit, Nov. 1
Gasoline	85 Baumé	19,000	5.42	102,980 B.T.U.	21c per gal.
"	75 "	19,000	5.69	108,110 "	15c "
"	68 "	19,000	5.89	111,910 "	10c "
Naphtha	58 "	19,000	6.20	117,800 "	8¼c "
"	50 "	19,000	6.48	123,120 "	6c "
Kerosene	48 "	19,000	6.55	124,450 "	4c "

The fractional distillation results in percentages of the various fractions as shown by Floyd in the following table:

PERCENTAGES OF THE WHOLE IN THE SEVERAL FRACTIONS

Specific gravity Baumé	70.1	70	58
Distillation	1	2	3
Boiling point	120 F.	88 F.	140 F.
10 Per cent. at	143 F.	140 F.	170 F.
20 " " "	153 F.	152 F.	178 F.
30 " " "	162 F.	161 F.	188 F.
40 " " "	169 F.	170 F.	195 F.
50 " " "	178 F.	182 F.	202 F.
60 " " "	185 F.	195 F.	210 F.
70 " " "	194 F.	212 F.	220 F.
80 " " "	205 F.	232 F.	235 F.
90 " " "	227 F.	260 F.	254 F.
96⅔ " " "	257 F.	298 F.	278 F.

The time has arrived in the consumption rate of hydro-carbon fuel when it is no longer possible to consider that the lighter distillates can be obtained in sufficient quantity to supply the demand. The situation is further complicated by the fact that so many uses are now experienced for the lighter fractions that it is doubtful if they find lodgment at all in automobile gasoline. The trend is in the direction of kerosene oil. The probabilities are that some kerosene oil is actually present in automobile gasoline of the market, and in an attempt to standardize this fuel it will probably have to be limited to a statement of the proportions of the respective fractions with hexane as the most volatile of the series, and to whatever extent the heavier fractions may be used in practice it is advantageous to advocate them, but there should be some definite mixture to which the distillers of crude oil would agree to adhere in order that carbureter makers would be able to build and adjust carbureters under more stable conditions than are now in evidence, and the makers of motors would be able to discuss questions of compression and thermic relations generally in the light of the fuel to be used. When account is taken of the fact that compression has a marked influence upon thermal efficiency, power and flexibility, it remains to observe that any process which will interfere with the intelligent discussion of these matters, and the fixing of standards for the best result, is too crude and intolerable to be perpetuated.

Any Fuel Will Burn Under Certain Conditions

A couple of years ago when hat-makers and those who compile perfumery for certain uses, were bent upon having the internal revenue removed from grain alcohol, they sent a "lobby" to Congress and the strongest argument they presented to pry opposition out of the grasp of the Congressional Committee was that gasoline, like the noble red man, was becoming obsolete, and that alcohol could be put to a more fitting use than it is on occasions in that it would take the place of gasoline, and do the work with equal efficaciousness; moreover, it was said that farmers would be given a profitable outlet for such crops as might be used in the distilling of grain alcohol.

Farmers were not the only ones who were "gold bricked" by the "lobby," but it is to be said in favor of the Congressmen who were taken in that they were as well informed about automobile motors and the fuel requirements as the farmers, and the probabilities are that the hat-making industry has benefited somehow, although purchasers of hats are unable to see either a shading of the price or an improvement in general appearance of the product, and perfumery is so hard to estimate as to its intrinsic worth that we give it up. In the meantime it has been proven that alcohol is of no value worth mentioning in automobile motors as they are regularly made, due to the fact that the compression in a motor, if it is designed to burn gasoline, is too low to burn alcohol efficiently; moveover, it is extremely difficult to start a motor if the compression is low, provided alcohol is substituted for gasoline as the fuel, and besides, the cost of alcohol has not been reduced to the level as promised by the alcohol "lobby," nor has the price of gasoline soared to the heights as threatened by this same "lobby."

Nothing seems to have come true excepting the problem which ever confronts the designers of automobile motors, and the builders of carbureters, and the fact that gasoline is a little uncertain in its makeup, so that it is not to be regarded as a fitting foundation for efforts of standardization of motors as it now stands.

Some Earnest Work Will Have to Be Done

It will be impossible to look to the Congress for a remedy for the difficulties that are confronting the makers of motors and carbureters, nor is it to be supposed that the distillers of hydrocarbon fuel will be able to alleviate the troubles, but it is more than likely that automobile engineers can, by earnest work and concerted action find out what is the matter, and then tell the distillers of petroleum of the things that will be necessary for their more complete success. It is almost unnecessary to relate how success is a brood-hen with such ample spread of wings as to cover not only the distillers, but the motor builders, and finally the patrons of the industry, from whom, let it be remembered, all blessings flow.

It is more than likely that the characteristics of the various grades of crude oil are thoroughly well appreciated by distillers, but their problem is a commercial one, with a considerable amount of stock in the hands of the controllers of the situation, and it happens to be true that this stock is in a never-ceasing cry for a dividend. Whether or not the experts of the crude oil industry will take the initiative in the matter of ascertaining the precise needs of the automobile industry, and undergo the possibility of reducing stock dividends in an attempt to improve the automobile situation, remains to be seen, but it is not necessary for automobile engineers to go into camp and wear out patience, awaiting the coming of this decision.

It is perhaps unfortunate that there are many problems involved in the distilling process, and they have so little to do with things mechanical that the average automobile engineer, when he is confronted by them, finds himself a little clumsy on his feet. As a preliminary to a discussion of the thermic conditions involving the motor, it is deemed expedient to re-state such of the fuel data as will have bearing upon the standardization problem, and in a general way the properties of the hydrocarbons will be re-stated from information given by G. H. Baillie in his paper before the R. A. C., London, 1908.

PROPERTIES OF THE PRINCIPAL CONSTITUENTS OF FUEL

	Formula	Density at 15 deg. C.	Boiling point	Lower calorific value per liter
Butane	$C_4 H_{10}$	.600	1	—
Pentane, iso-	$C_5 H_{12}$	.628	31	—
Pentane, normal	$C_5 H_{12}$	.626	36	—
Hexane	$C_6 H_{14}$	.674	68.5	7155
Hexahydrobenzine	$C_6 H_{12}$	.760	69	—
Hexahydrotoluene	$C_7 H_{12}$	.772	97	—
Heptane	$C_7 H_{16}$	.688	98	7380
Octane	$C_8 H_{18}$	.719	120	7560
Octane, normal	$C_8 H_{18}$	.707	125	—
Nonane, a	$C_9 H_{20}$	.740	136	7900
Nonane, normal	$C_9 H_{20}$	.722	150	—
Decane	$C_{10} H_{22}$	.738	160	8060
Benzene	$C_6 H_6$	.884	80.4	9690
Toluene	$C_7 H_8$	.871	111.0	—
Ethyl alcohol	$C_2 H_6$	.794	78.3	5270
Methyl alcohol	$C H_4$	.797	66.0	—

In the above tabulation the hydro-carbon fractions are arranged in the order of their boiling points, and it will be observed that the density and boiling points increase together only in one and the same series.

From the point of view of standardization it would seem that density is not the ground on which to condemn a fuel. This may be shown by the table if account is taken of the two napthenes given. Hexahydrobenzine has the same boiling point as hexane, but a density of .760 instead of a density of .674, which corresponds to hexane, whereas hexahydrotoluene, with the same boil-

ing point as heptane, has a density of .772 as compared with heptane at .688.

In all the tests that have been conducted heretofore hexane, heptane and octane were found to be present in varying quantities, and, roughly speaking, it seems to be true that hexane is the foundation of automobile gasoline. Thomas L. White, in a paper presented before the Society of Automobile Engineers, gave the composition of the various fuel products as follows:

COMPOSITION AND CHARACTERISTICS OF LIQUID FUEL PRODUCTS

Gasoline
Average composition, C = 84, H = 16.
Source, petroleum.
Boiling point, 50° to 150° Cent.
Specific gravity, .680 to .720.
Calorific value, 19,000 B. T. U.
Latent heat, small.

Benzine
Average composition, C = 92, H = 8.
Source, coal tar.
Boiling point, 80° Cen.
Freezing point, 5° Cent.
Specific gravity, .899.
Calorific value, 19,000 B. T. U.
Latent heat, small.

Alcohol
Average composition, C = 32, H = 8, O = 35.
Source, vegetable matter, principally corn, beets, potatoes, sugar cane.
Boiling point, 70° Cent.
Specific gravity, .806.
Calorific value, 12,600 B. T. U.
Latent heat, considerable.

Tar Benzol
Average composition, C = 92, H = 8.
Source, a by-product in the manufacture of coke.
Boiling point, 80° to 120° Cent.
Specific gravity, .895.
Calorific value, 19,000 B. T. U.
Latent heat, small.

Kerosene
Average composition, C = 85, H = 15.
Source, petroleum.
Boiling point, 150° to 300° Cent.
Specific gravity, .800 to .825.
Calorific value, 19,000 B. T. U.
Latent heat, considerable.

Motor Spirit, Naphtha, Benzoline, Benzine
Average composition, C = 85, H = 15.
Source, petroleum and shale.
Boiling point, 60° to 160° Cent.
Specific gravity, .750.
Calorific value, 19,000 B. T. U.
Latent heat, appreciable.

Methyl Alcohol, Wood Spirit, Naphtha
Average composition, C = 38, H = 12, O = 50.
Source, the distillation of wood.
Boiling point, 66° Cent.
Specific gravity, .812.
Calorific value, 9,600 B. T. U.
Latent heat, appreciable.

Acetylene Ethene
Average composition, C = 92, H = 8.
Calorific value, 25,000 B. T. U.

In Mr. White's discussion he referred to fuel products as "blends," and in defining these blends he pointed out that acetylene ethene is of the endothermic characteristic; in other words, that independent of its energy as a fuel, it is capable of decomposing with the evolution of heat when submitted to the action of great pressure, or heat, or both. It was further stated in quoting from an address on fuels for automobiles by Dr. Fritz Warschauer to the Association of German Chemists at Berlin: "As the burner of a kerosene lamp is formed differently from the burner of an alcohol lamp; as the construction of a gas burner is radically different from that of an acetylene burner; *so also the combustion motor must be especially adapted to the peculiar properties of the fuel used.*" (The italics are ours.) In this will be seen the suggestion that the motor be designed to suit the fuel that is to be burned in its combustion chamber. To the motor builder whose brand of conceit chloroforms his otherwise well-balanced state of mind, this looks like "putting the cart before the horse." Dr. Warschauer seems to have taken into account the fact that fuel is Nature's own, whereas man builds motors.

Detonating Products Should Not Be Entertained

Endothermic compounds probably represent the class of hydrocarbons that are too hazardous to be used with equanimity in automobile motors, but there are quite a number of composite fuels of which it might be said they would serve for the purpose efficaciously were it not for the uncertainties involved in that they will detonate under certain conditions, and the skill of an ordnance master would have to be common property of those who drive automobiles. In the early days of racing, when rules as promulgated were in nowise intended to retard the progress of the winner, and handicapping was a science that did not hinder the judgment of the regulators of these events, "doped" fuel was not uncommon, and picric acid was then a prime favorite. Experimenting along these lines seems to have developed the fact that the physicists were dealing with explosives rather than with fuel, as, for illustration, ammonia nitrate up to 6 or 7 per cent. increases the rate of flame travel advantageously when it is properly incorporated into the mixture, and it would even be possible to extend the ammonia nitrate content as far as 15 per cent. under well-contrived conditions without seriously approaching the detonating point. But it is difficult to produce a stable mixture with ammonia nitrate, and the automobilist is confronted by the possibility of ultimately entertaining a residuum holding sufficient ammonia nitrate to bring about the dreaded detonation, and this same possibility resides in substantially all of the composite mixtures that are partly made up of the same ingredients that serve so efficaciously in gunnery work.

This question of the detonation of composite fuels is one of the serious matters that automobile engineers should take up and standardize. It is not impossible for a "half-baked" chemist to collect gasoline, grain alcohol, water, acetone and ammonia nitrate, and with these ingredients produce a fuel that will have a high rate of flame travel, excellent volatility, the maximum of calorific, all attended by a low price, with the fuel to remain stable for several months, but it holds within its makeup the element of detonation and it is positively dangerous to place this fuel at the disposal of plain citizens and expect of them that they will have all the arts and wiles of the gunner and the expert in ordnance.

In constant work there seems to be no equitable reason why a racing driver should be permitted to employ detonating substances as a substitute for fuel, particularly if it can be said that this fuel is too dangerous to use under every-day conditions; moreover, the chances are excellent for the eroding of the polished surfaces of the cylinders and other parts with which this fuel during the process of burning, or as the result of decomposition, might attack and destroy. A committee on standards might well pass upon the fuel first, find out whether or not it will detonate, observe to what extent it will destroy the vitals of the motor, and ascertain from commercial sources if it is an available product at a competitive price, and if it possesses all these necessary qualifications it will be time enough to allow racing drivers to indulge in its use.

Other Complications Attend the Use of Mixtures

The best illustration of the difficulties attending the use of composite fuel will be found in a perusal of the relations of air to liquid fuel as they have been traced in connection with the regular products of the marker, with the understanding that these difficulties will be more marked if the fuel mixtures traverse outside of the zone of known quantities. It is one thing to have more or less definite information about the fractions of hydro-carbons, but it is quite another matter to assume that there is nothing more to be done than to compound stable mixtures of gasoline, alcohol, water, acetone and detonators. Confining the discussion for the time being to the fractions known as hexane, heptane, octane, decane, benzine and ethyl alcohol, reference will be made to the results obtained by Baillie in his attempt to fix the proportions of fuel to air, and arrived at the conclusion that no two of these fractions would produce the desired result with a fixed ratio of the air to the fuel; moreover, the characteristic performance of the respective contents under varying conditions of air to fuel is so much at variance that motor flexibility is relegated to the realm of speculation. The table as follows shows the minimum tempera-

ture at which fuel exists as vapor under varying proportions of the air to the fuel.

MINIMUM TEMPERATURE AT WHICH FUEL EXISTS AS VAPOR

Air	20 per cent less	Right amount	20 per cent more	40 per cent more
Hexane	-14.2	-17.7	-20.6	-24.2
Heptane	7.3	3.6	0.7	2.0
Octane	22.9	19.0	16.0	13.0
Decane	46.1	42.0	39.0	36.5
Benzene	-0.7	-4.3	-6.9	-8.3
Ethyl alcohol	26.5	23.3	20.7	17.8

A study of this table shows that octane, decane and alcohol cannot exist as vapor under ordinary atmospheric conditions except in a very weak mixture. It is also pointed out that the considerable difference between benzene and alcohol accounts for the difficulty which has been experienced in the use of these two fuels combined in internal combustion motors. Benzene, as it will be remembered, is a definite hydro-carbon, asbstracted from coal tar products, answering to the formula $C_6 H_6$. It is frequently the case that benzene and benzine are confused with each other. Benzene differs from benzine to the extent that the former is a popular hydro-carbon as above pointed out, whereas benzine is a popular spirits distilled from petroleum. Benzol is a mixture of benzene and other coal tar spirits.

Difficulty Arises in Vaporizing the Liquid

In the table showing the minimum temperature at which fuel exists as a vapor, it was assumed that the fuel would be mixed in vapor form, but if these fuels were to be mixed in the form of liquid at the temperatures named in the table complete vaporization would not be realized, due to the fact that in the process of vaporizing the temperatures would be lowered. In automobile work the liquid gasoline is sucked out of a nozzle of the carbureter and in more or less globule formation it is entrained in a stream of air as it passes from the orifice of the carbureter on its way to the combustion chamber. The problem of vaporization becomes at once acute, excepting when a single hydro-carbon distillate of high volatility is employed. The table as follows shows the drop in temperature due to evaporation, considering the same series of hydro-carbons as in the previous case, including ethyl alcohol.

DROP IN TEMPERATURE DUE TO EVAPORATION OF THE LIQUID

Air	20 per cent less	Right amount	20 per cent more	40 per cent more
Hexane	23.3	19.0	16.3	14.2
Heptane	22.4	17.9	15.0	12.8
Octane	21.5	17.2	14.3	12.3
Decane	18.5	14.8	12.4	10.6
Benzene	47.3	32.2	23.5	20.9
Ethyl alcohol	95.5	76.3	63.7	54.6

As a further indication of the impracticability of composite fuel from this point of view, it is only necessary to observe that the alcohol in evaporating lowers the temperature twice as much as in the case of benzene. There is an additional incongruity to be noted. Take, for illustration, heptane alongside of benzene; it was shown that these two products vaporize at about the same temperature, but it is indicated in this table that the benzene produces twice the drop in temperature as that of heptane. There are differences of this character throughout the series, and in motor work, if by any chance the lighter hydro-carbons of a composite mixture are given off first, the carbureter adjustment will cease to be efficacious, due to the change in the drop in temperature of vaporization that must of necessity take place.

Temperature of the Air Must Be Regulated

In view of the limit which must be placed upon the temperature of the fuel as it exists in the form of vapor, and considering the drop in temperature due to the vaporization of the liquid fuel, it remains to make provision for the transfer of heat from the body of air as it takes up the fuel, and it therefore follows that there is a certain minimum temperature of air before evaporation of the fuel, and that this minimum is a variable depending upon the percentage of air to the liquid, remembering, of course, that the specific heat of air is low, and the deficit can only be made up by supplying the air either in excess or at a sufficiently high temperature to balance the heat units in the air against the heat units required in the evaporation of the liquid during the mixing process. The minimum air temperature allowable under certain conditions are given as follows:

MINIMUM TEMPERATURE OF AIR BEFORE EVAPORATION

Air	20 per cent less	Right amount	20 per cent more	40 per cent more
Hexane	9.1	1.3	-4.3	-10.0
Heptane	29.7	21.5	15.7	10.8
Octane	44.4	36.2	30.3	25.3
Decane	64.6	56.8	51.4	47.1
Benzene	46.6	27.9	16.6	12.6
Ethyl alcohol	122.0	99.6	84.4	72.4

This table brings out the reason why hexane is a superior liquid fuel to employ in internal combustion motor work. It is the only fraction in the hydro-carbon series that will evaporate completely in a cold engine when the theoretically right amount of air is supplied. It follows, in view of this fact, that hexane is the fuel that will afford the highest thermal efficiency of a motor, and this is in the face of a set of conditions that might indicate to the contrary. The density of hexane is .674; its boiling point is 68.5 centigrade, and its calorific is 7,155. Decane, on the other hand, has a density at 15 degrees centigrade of .738; it boils at 160 degrees centigrade, but the calorific increases of 8,060, thus indicating that if decane could be vaporized in a cold engine with the theoretically right amount of air the available power would be on the increase in the ratio of 7.155 to 8.060. In like manner there would be differences between the respective fuels, and hexane would apparently be an inferior product.

Some attention should be given to the question of when and where the liquid gasoline is to be supplied with the heat of vaporization. It is admitted, of course, that the liquid gasoline begins to vaporize at the instant of expansion when it is leaving the nozzle of the carbureter. Whether or not heat should be supplied to both the liquid in the float-bowl and to the expanding gasoline as it leaves the nozzle of the carbureter are matters that are evidently handled without recourse to a standard, as is proven by the great variety of carbureters that are to be found in actual practice.

But if the gasoline is not maintained at a constant temperature in the float-bowl, and as it leaves the nozzle of the carbureter, the viscosity of the liquid will vary, (a) depending upon the temperature changes, and (b) on a basis taking into account the distillates present in the mixture, and their behavior in view of their relations to each other. For hexane it has been found that the weight of the gasoline in relative terms that will pass through an orifice under varying conditions of temperature is as follows:

Degrees F.	50	59	68	77	86	95
Weight in Unit Time	1	1.073	1.145	1.212	1.27	1.335

These values were stated in an article in THE AUTOMOBILE December 31, 1908.

It will be observed that there is a very considerable difference in the rate of flow of the gasoline as between a temperature of 50 degrees Fahrenheit and, say, 95 degrees Fahrenheit, which differences in temperature might readily take place by atmospheric changes within a single day in certain parts of the country, or between Winter and Summer work. But if such extreme differences in the flow of the gasoline are to be expected when the temperature changes a matter of 45 degrees Fahrenheit, it is to be expected that the differences in the flow of gasoline will be enough to upset the relations noticeably with a smaller change of temperature. When it is taken into account that 2 per cent. of the total weight of mixture at any one time, if liquid gasoline, would constitute what is known as a rich mixture, it will be quite plain that a small variation in the rate of flow of the liquid gasoline will suffice to bring on a poor set of thermal relations, resulting in either a low thermal efficiency or a contraction of the range of stability in the performance of a motor.

Are Auto Tires Worth Repairing?

Editor THE AUTOMOBILE:

[2,477]—I have several tires that have at one time or another come to grief. The bursts in some cases are about 8 inches long. There are no facilities for repairing tires around where I live in the country. I should like to know if it is worth while making a parcel of them all and having them repaired, or scrapping them and putting the money they would cost to repair towards new tires.

Norwalk, Conn. TIRED.

The advisability of having tires repaired depends upon the condition of the main body of the canvas. If this is in good order it is more economical to have them repaired or rethreaded than to throw them away, as the cost is usually less than half the price of a new tire, and if the repairs are properly carried out they should last more than half the life ordinarily expected of a new tire. One point should be borne in mind and that is that there is no use trying to stop a hole in a tire by filling in the outside rubber if the foundation has been damaged; the section must be rebuilt. The process is explained in the accompanying illustrations. Fig. 1 shows the rubber tread being removed about the part affected, leaving the canvas body bare. Fig. 2 shows the different layers of canvas being ripped off, leaving one or two layers out of the five or six that compose the body as a ground on which new layers are placed after each is treated in the manner shown in Fig. 3. Fig. 4 represents a tire that has been so filled up ready to take the uncured rubber strips that form the tread. To satisfactorily repair a burst tire each one of these processes must be carried out, and if properly executed the tire should be good. Unless you can be sure that they are going to be done do not have the work done at all as it will not last.

If the canvas is not pierced the ordinary vulcanizers on the market that can be applied to the tire while on the rim are undoubtedly good investments as they stop the source of trouble and prevent the gash becoming an open wound.

Fig. 1—Removing tread and baring canvas

What Some Subscribers Desire to Know

The Editor invites owners and drivers of automobiles who are subscribers to THE AUTOMOBILE to communicate their automobile troubles, stating them briefly, on one side of the paper only, giving as clear a diagnosis as possible in each case, and a sketch, even though it may be rough, for the purpose of aiding the Editor to understand the nature of the difficulty. Each letter will be answered in these columns in the order of its receipt. The name and address of the subscriber must be given, as evidence of good faith, adding a nom de plume if the writer desires to withhold his name from publication.

Police Regulations and Distinctions in Magnetos

Editor THE AUTOMOBILE:

[2,478]—Being a subscriber to THE AUTOMOBILE I would like to have the following questions answered under "Letters Answered and Discussed."

1. How to find the cost per mile of the wear of tire?
2. What is the difference between Bosch dual ignition and Bosch duplex ignition?

Fig. 2—Ripping off layers of canvas

3. Where could I get a copy of the city driving regulations of New York?
4. Could you furnish the rates charged by the day and hour for a private seven-passenger car?

Montclair, N. J. E. D.

1. There is no way that can be depended upon to ascertain the cost of tire mileage in the abstract, due to the wide difference in service between tires on the various makes of cars, and the several cars under varying conditions of work. For your own car you have but to keep the cost.
2. If you will write to the Bosch company it will no doubt forward to you its literature describing the two systems of ignition referred to.
3. Direct a letter to the Commissioner of Police, New York City, and a printed copy of the regulations will be forwarded to you.
4. There is no regular rate excepting by taxicab companies for private service of a car.

Suggestion Is Without Merit

Editor THE AUTOMOBILE:

[2,479]—I have a four-cylinder engine with two complete and separate systems of ignition, magneto and battery, with two plugs to each cylinder on opposite sides of combustion chamber. In view of your article on tests in Germany showing gain by firing through two plugs, I am wondering whether I would gain anything by connecting the battery and magneto plugs on each cylinder with each other, so that when either battery or magneto was being used both plugs would be in use. If this is practical it ought to facilitate starting by giving the same power as with spark advance, yet without danger of back kick. Would there be any danger of injuring the coils of the battery system by the magneto current when both magneto and battery were on with plugs connected?

Phœnixville, Pa. F. C. HARTSHORNE.

The increase in power that is claimed for a double simultaneous ignition system is not possible of attainment through the use of systems as ordinarily installed on automobile motors. There would not be one chance in one hundred of getting the two systems to spark simultaneously. Unless the sparks occur at the same instant, the results are no better than if one spark is used. The increased expansion pressure due to two simultaneous sparks might possibly injure the motor.

How to Store Tires for the Winter

Editor THE AUTOMOBILE:

[2,480]—Will you kindly give me instructions as to care of tires and rims while the car is stored for Winter. Is not paint better than shellac to use on rims? Would you paint all of the detachable ring of a rim?

What is an easy way to separate inner tube from casing when stuck fast?

M. K. WATKINS.

Mount Carmel, Pa.

Wash tires with tepid water rendered soft

What Other Subscribers Have to Say

DISCUSSED

The Editor invites owners and drivers of automobiles who are subscribers to THE AUTOMOBILE to communicate their personal experiences for publication in these columns for the worthy purpose of aiding brother automobilists who may be in need of just the information that this process will afford. Communications should be brief, on one side of the paper only, and clearly put, including a rough sketch when it is possible to do so, and the name and address of the writer should be given as evidence of good faith, adding a nom de plume if the writer desires to withhold his name from publication.

by castile soap, and after they are dried perfectly they may be smeared over with either talcum powder or graphite in the finely divided state and then wrapped up in black oil-paper or burlap and stored in the cellar. The place of storage should be a little damp, with the temperature ranging around 50 to 60 degrees Fahrenheit, selecting the darkest corner. Nine cellars out of ten as they are ordinarily constructed for residences will serve perfectly for the storage of tires. The best way to keep the rims is to clean them off as well as possible, heat them up to a point which will melt bee's wax, and smear the wax over the surfaces to form a protecting film. Rust will not form in the presence of bee's wax.

Soak the tubes in hot water until the inner tube detaches from its fastening.

Wants to Know About Chassis Frame Materials

Editor THE AUTOMOBILE:

[2,481]—Would you oblige me by publishing answers to the following questions in the inquiry department of THE AUTOMOBILE?

1. What do you consider a safe working unit stress for (a) cold-rolled, (b) 3 1-2 per cent. nickel steel, (c) chrome-nickel steel, when these materials are used in cold-pressed automobile frames?

2. To state the same question in other words, to what fraction of its elastic limit should the material in a frame be stressed? Kindly give this for both touring and racing car work.

3. Which method of determining the safe loads for frames is most generally employed, theoretical or practical? By "theoretical" method is meant simply locating the point where the maximum bending moment occurs and applying the formulæ for strength of beams, involving the moment of inertia of the cross-section, etc. The "practical" method would, of course, consist simply in steadily increasing the load upon a frame, noting the deflection and amount necessary to stress it to its elastic limit, etc. Thanking you for any aid which you may give to "one of your subscribers," I remain.

Flushing, N. Y. D. H. W.

1. Cold-rolled steel should not be stressed above 5,000 or 6,000 pounds per square inch. Three and one-half per cent. nickel steel should not be stressed above 10,000 pounds per square inch, as a general proposition. Chrome nickel steel is never used in cold-pressed chassis frames.

2. It is not possible to state that some fixed percentage of the elastic limit should be regarded as the maximum working point, due to the fact that the percentage of impurities in the metal and a dozen other considerations would have to be disregarded under such conditions.

3. Several years ago designers of automobiles went to some pains in the figuring out of the sections of chassis frames and experience has shown that all of the figures were wrong, and all chassis frames as they are now made are of far greater section than could be arrived at by a rational formula. The difficulty lies in not having the proper data with which to make calculations, and experience seems to be the teacher that most of the automobile makers owe their allegiance to.

Fig. 3—Solutionizing layers of canvas

Courting Trouble by a Well-Known Method

Editor THE AUTOMOBILE:

[2,482]—I am a subscriber to THE AUTOMOBILE and would like to know your idea on a rim made with large threads and a detachable rim with threads to fit over it, and a locking device to hold same in place. This I think could be changed quicker than any now in use. The threads would be large enough so as not to be difficult to start, and so shaped that they would not run tight. Kindly let me have your opinion on same through your "Letters Interesting" columns.

Rochester, N. Y. W. B.

It is highly improbable that the scheme of threading suggested will prove over satisfactory in view of the fact that the accumulations of the road form a cement that sets so hard that rim members separated as much as one-quarter of an inch from each other adhere so tenaciously that it becomes almost impossible to demount them. All slow tapers, so-called, seem to be failures in rim work. Threading as suggested would have the same fault concealed in it.

Wants to Know About Valves in the Head

Editor THE AUTOMOBILE:

[2,483]—Can you tell me about what proportion of pleasure automobile manufacturers place valves in the head? If it would not take too much space, would like to know briefly the reasons for and against this method.

Waterford, Pa. CHARLES HIMROD.

The proportion of motors using valves in the head is relatively low, these types of motors being built by probably less than ten companies, but this is no criterion, nor can it be said that a scheme ranks above or below some other scheme based upon the number of adherents to the plan. The idea of the designers of this type of motor is to get more power for a given weight and to realize a higher thermal efficiency, but they have to be careful in the execution of the work, otherwise the overhead valve construction will be noisy.

Fig. 4—Applying the new tread

Ivory White Finish

M. C. HILLICK DESCRIBES THE TECHNIQUE OF THE IVORY WHITE FINISH WHICH IS COMING INTO VOGUE IN AUTOMOBILE WORK

THE late Madison Square Garden Show demonstrated one thing very conclusively, *i. e.*, that the torpedo body painted in ivory white constituted an irresistible attraction, which attraction was created quite as much through the medium of the ivory white surface, with its spotless, mirror-like effect, as through anything else. Thousands of visitors were asking how this ivory white surface, with its sleek, semi-gloss finish, was obtained.

As in part replying to them and in part—in larger part, perhaps we should say—tendering the information to readers of THE AUTOMOBILE who in some way are directly interested in the making or repairing or using of the horseless vehicle, we offer the following method of producing the ivory white finish:

First the priming coat, speaking now of new work only. With No. 1 1-2 sandpaper work the wood over all the car down smooth and clean, paying particular attention to the coarse, rough patches of timber. Then with an oval bristle brush, having a soft, elastic point, apply a nicely brushed-on coat of oil and white lead primer.

If the surface is of aluminum or steel wire brush it, and wash it over with turpentine, and wipe dry before priming. Use for a first coat an elastic, specially prepared, metal primer, which, all things considered, is cheaper than the shop-made article, and quite as good in every element that enters into the composition of the metal primer. If preferring, however, to mix the primer the painter may do so by grinding through the shop paint with some pale yellow ochre and adding raw linseed oil to the desired quantity of ochre to produce the right consistency. About the amount to be used in this work should be sufficient to stain the oil strongly. For metal the oil had best be let down some with turpentine in order to reduce the volume of oil and insure speedier and harder drying for the primer. Whether the surface be of wood or metal do not attempt to sandpaper it much. Just a slight brush over to break down possible dirt nibs. Then for second coat, either in case of wood or metal, mix the pigment with oil ground white lead, beating the lead in raw linseed oil one part and turpentine 3 parts, with a gill of pale drying japan added to each quart of the material. Beat up thoroughly, and apply with the first coat, brush working the coat out sleek and satiny. Upon this coat, when dry, do any necessary puttying, using a dead white putty, made of 3 parts dry white lead and one part best bolted whiting mixed to a working consistency with equal parts of pale drying japan and rubbing varnish. Let this putty, after application, dry 24 hours, whereupon apply a third coat of surfacer consisting of oil ground white keg lead mixed to a thin brushing consistency in one part raw linseed oil to 6 parts of turpentine, beating the pigment up to an even, uniform working and flowing consistency. Brush on as above directed. Let this coat stand in a good drying apartment for 40 hours at least—longer if time permits. Next apply three coats of roughstuff, and a guide or stain coat, getting the four coats on in two days. Make the roughstuff as follows: Equal parts of dry white lead and soapstone flour with a bit of pulverized pumice stone added to afford proper cutting properties. Thinners, equal parts of rubbing varnish and turpentine. For each pint of this roughstuff add a teaspoonful of gold size japan.

Rub this coarse surface down with artificial rubbing stone until both a level and smooth field of pigment is obtained. After rubbing stand aside until the following day for the evaporation and expulsion of moisture. Then lightly sandpaper the surface with No. 0 sandpaper to polish the ground and flick off any adhering foreign substances. We are now ready for the ivory white, which had best be obtained direct from the manufacturer. To shop mix it, however, which in some cases it may be either necessary or advisable to do, add raw sienna to flake, or silver, or arctic white, japan ground, in the approximate proportion of one part sienna to 95 parts white. The relative strength or coloring power of the pigments will, in a large measure, govern the proportionate quantity of pigment required.

For the first coat of white break the pigment up in turpentine, adding one part raw linseed oil to 10 parts of turpentine. Apply first coat as a flat color to dry without gloss, making the application with a treble thick, 2 1-2-inch, or 3-inch, flat camel's hair brush.

At this point should be emphasized the necessity of maintaining the surface free from finger marks, dirty stains, or discoloring effects of any sort. This is one of the really nice bits of work connected with keeping the very delicate surface free from discolorations and smears, and it has a direct bearing upon the quality of the surface obtained.

For the next coat of ivory white stir a quarter of a pound of the white, thinned gradually in turpentine, in a couple of pounds of rubbing varnish, and apply to the surface with a flat, half elastic bristle brush. Let this coat stand, say, 3 days, and in the case of an elastic rubbing varnish, 4 or 5 days, the drying conditions of the shop to no small extent governing this matter; at the expiration of which time rub lightly over with a bit of felt cloth dipped in water and pumice stone flour. Having deadened the lustre, and removed dirt motes, etc., wash up and apply second coat of this same varnish color.

This second coat should give a fine, solid effect. For the highest class work, apply, in due season, a third coat of this varnish color. After three days rub as before, and apply striping and other necessary ornamental effects. Over this flow a thin coat of pale or colorless rubbing varnish, allowing it to dry four days, when it should then be lightly and uniformly rubbed, washed up, and in the event of letting the surface go in a full gloss, finished with a high grade, elastic finishing varnish.

If the dull finish or semi-gloss style of effect is desired, apply over the last coat of rubbing varnish, after rubbing and cleaning thoroughly, a hard drying finishing varnish of as pale a body as it is possible to get. Let this varnish in good drying quarters stand for nine or ten days to harden fast and firm. Then, first with pulverized pumice stone and water, rub the surface moderately and uniformly, after which rub with rotten stone and sweet or crude oil to a flat, semi-gloss finish, using for this last rubbing a piece of chamois skin for the surfacing pad. In rubbing the varnish avoid heating it, thus shredding it or roughing it up. Clean up the oil and pumice stone flour by first dusting common wheat flour over the surface. Catch this off with a soft duster and wipe dry with a clean piece of silk.

It Stands to Reason—

That the use to which an automobile is to be put must be in the mind's eye at the time of purchase.

That the truck, for illustration, that is employed in racing along the road, is not being put to its proper use.

That passenger automobiles, although they are not designed for racing purposes, are frequently placed in that service.

That there is more in selecting the accessories than the average buyer is aware of; they should be purchased; few, indeed, are the things that are worth while coming as premiums with a pound of tea.

In the Building of Balloons

PROFESSOR WILLIAM B. ENNIS PRESENTS TECHNICAL INFORMATION UPON AERIAL SUBJECTS FOR THE PURPOSE OF CLEARING UP SOME OF THE PROBLEMS THAT DEFY SOLUTION BY A CUT-AND-DRY METHOD—FINAL INSTALLMENT

ANY mechanical device can be best designed if the load factor is high; *i.e.*, if the ratio of the variable part of the load to the constant part is low. In the balloon this load factor is zero; the load is all variable; and when we consider the absolute necessity of keeping the power capacity down to the lowest possible point in order to avoid dead weight, we may realize the disadvantages of our position. If we are to move at pleasure, our engine must be designed say for a velocity equal to that desired plus the highest probable adverse wind velocity—say of 60 miles per hour. If our cruising speed is to be 10 miles per hour the engine must then be $\frac{70^3}{10^3} = 49$ times as large as is normally needed; if 20 miles, then $\frac{80^3}{20^3} = 16$ times as large; and so on. In the very case where bulk and weight of engine should be cut down, in order to economize in lifting power, they must be tremendously increased to meet adverse wind conditions; or else we must be content to have our timetable subject to frequent (incessant) changes without notice, on account of breeze conditions.

Net Carrying Capacity.—Let the weight of engine, shaft and propeller be w pounds per horsepower of capacity. The *total weight of mechanism* is then wH. (We will disregard the question of a reserve motor; possibly air cooling may be found practicable by keeping the cylinders small; or it is barely possible, if unlikely, that for sea voyages a means may be found for drawing up and circulating sea water in jackets.) Let the fuel consumption per horsepower hour be f pounds and the desired time of flight h hours. The *weight of fuel* to be carried is then Hfh pounds. (This fuel is in a sense ballast, although not very flexible ballast.) Let the weight of gas bag fabric per square foot be c pounds. The *bag* surface is

$$(2 \times 0.7854\ d'^2) + 3.1416\ d^2a \text{ (Equation D)},$$

and its *weight* is

$$(3.1416a + 1.5708)\ cd^2 \text{ pounds.}$$

The *carrying capacity* of the balloon, as a rough average, is 0.07 times its displacement. Then, the sum of weights of car, occupants, bracing and all the sundry necessaries, or the carrying capacity over and above motor, fuel and gas bag, is

$$0.07 \times 26{,}820 - wH - Hfh - (3.1416a + 1.5708)\ cd^2 \text{ pounds.}$$

Arithmetical Results.—These formulas have meaning only as analyzed; but conversion into figures will lead to some conclusions. For our balloon let the ratio of length to diameter be 10; involving, of course, a large amount of bracing if not some metal sheathing. Then, for the diameter d we have

$$0.7854\ d^3 \times 10d = 26{,}820,$$

whence d = 15.03 feet, and the head end area is $0.7854 \times 15.03^2 = 177.6$ square feet. Let the desired cruising speed be 40 miles per hour in still air, the balloon being kept in the hangar if the adverse wind velocity exceeds this. The corresponding unit pressure per square foot is $0.0025 \times 40 \times 40 = 4$ pounds, and the engine horsepower is (Equation C)

$$\frac{177.6 \times 4 \times 88 \times 40}{33{,}000} = 75.9.$$

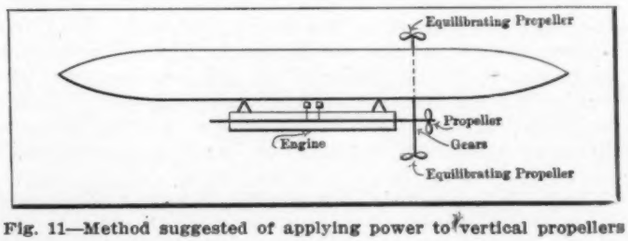


Fig. 11—Method suggested of applying power to vertical propellers

Aeroplane engines range in weight from 2.4 to 4.0 pounds per horsepower. If we take 3.5 pounds as a conservative figure our power plant weight must be at least $3.5 \times 75.9 = 265$ pounds. If the engine efficiency is 10 per cent. from fuel to propulsion, the weight of gasoline consumed will be about 1.34 pounds per horsepower hour; and if we wish to remain in the air 5 hours under still air conditions we must carry $75.9 \times 1.34 \times 5 = 507$ 1-2 pounds of gasoline. The superficial area of gas bag fabric, no allowance being made for seams, is (Equation D)

$$(177.6 \times 2) + (3.1416 \times 15.03 \times 150.3) = 355.2 + 7{,}080 = 7{,}435.2 \text{ square feet,}$$

and if it weigh even as little as 0.06 pound per square foot its total weight is $0.06 \times 7{,}435.2 = 446.1$ pounds. The total weight of engine, fuel and bag is then $265 + 507.5 + 446.1 = 1{,}218.6$ pounds, against an approximate total carrying power of $26{,}820 \times 0.07 = 1{,}877.4$ pounds, so that there is a margin of only $1{,}877.4 - 1{,}218.6 = 658.8$ pounds for all bracing, stays, ropes, tackle, fuel tanks, car, occupants, auxiliary machinery and ballast. The problem only just escapes becoming one of *reductio ad absurdum*. High engine efficiency, low engine weight, a fuel of high heating value in proportion to its weight, and a light, strong gas bag fabric are essential.

Dynamic Altitude Control

Vertical Propulsion.—Our 76-horse power engine was capable of moving the balloon at a speed of 40 miles per hour in still air, or of just overcoming a resistance of 4 pounds per square foot, 710.4 pounds total, while the balloon is standing still and subjected to an adverse 40-mile breeze. Suppose this engine power could be readily applied to a vertical propeller shaft, so as to be exerted upward or downward (Fig. 11). Our balloon contains 162 pounds of hydrogen, each pound of which has an approximate lifting power of $\frac{1{,}877.4}{162} = 11.59$ pounds. Our engine weighs 265 pounds, and has an equilibrating power, if applied vertically, of 710.4 pounds, or of $\frac{710.4}{265} = 2.69$ pounds per pound of weight. It is less than 1-4 as effective in lifting, weight for weight, as the hydrogen; but it is available as long as the fuel supply holds out, and is perhaps equivalent to 1,420.8 pounds of ballast. If our gas were totally exhausted the load of 1,877.4 pounds might be wholly sustained by an engine of

$$\frac{1{,}887.4}{710.4} \times 75.9 = 200 \text{ horsepower,}$$

weighing $200 \times 3.5 = 700$ pounds; but this would consume 268 pounds of gasoline per hour, so that our flight would necessarily be of very brief duration.

Water Equilibration.—In Fig. 12, let a timber block of one square foot area, ten feet long, weighing 380 pounds, be suspended from the balloon, in the ocean, and let mechanism be provided by which this block may be raised or lowered at pleas-

ure. When completely immersed in water it exerts an upward pressure of $624 - 380 = 244$ pounds, which may be used as supplementary lifting power for the balloon. If wholly withdrawn from the water it loads down the balloon with its own weight of 380 pounds. It exerts neither lifting nor weighting power when pulled upward until

$$24.4\ l = 38\ l_1,$$

where l = length of submerged portion and l_1 = length of portion out of water; and since $l + l_1 = 10$, $l = 6.09$ feet at this condition. By adjusting the vertical position of our timber buoy we may then vary the lifting power of the balloon through a range of $380 + 244 = 624$ pounds. In the Wellman-Vaniman equilibrator a string of tanks partly filled with fuel was used in place of the timber block. As the tanks were emptied the scope of control was increased; and this should be apparently an ideal condition of things, the supplementary control increasing as gas leakage caused the gas control to decrease; but the unsailorlike disregard of the conditions resulting from the strains transferred from a choppy sea to the delicate gas bag fabric led to disaster, and it is doubtful whether this method of control can ever be made practicable. If we are to look to water for our buoyancy, why not look wholly to water and build a ship instead of a balloon?

Summary

The following conclusions seem warranted: Since air has for our purpose no attainable limiting upward surface, stability at a given altitude varies with the pressure and temperature of both air and gas and with the elasticity of the gas bag. Control of altitude is essential in order that we may avoid unfavorable wind conditions. For every different altitude the conditions of stability are different. Temperature influences may perhaps be somewhat offset by painting the bag white to reflect heat. Of the various methods for controlling stability, venting of gas soon expends our lifting power, and the use of supplementary ballast, while involving great additional cost and motor power, only postpones the evil day. The carrying of supplementary gas supply under pressure, or provisions for heating the gas, offer no adequate remedy. The use of supplementary tanks containing air greatly increases the flexibility of control and seems to promise an increase in maximum time of flotation.

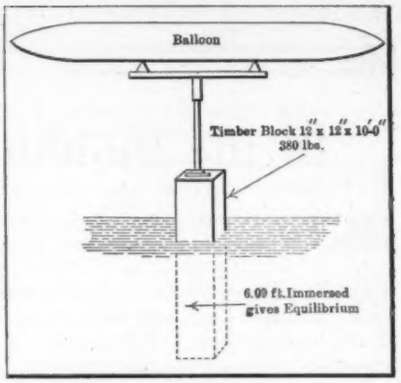


Fig. 12—Illustrating equilibration by means of a wooden block in water

The power problem is made extremely difficult because of the tremendous influence of air velocity. Only the nicest design or the use of colossal balloons will give any carrying capacity in excess of that necessary for power plant, fuel and gas bag fabric. Even then the dirigible balloon will always be seriously affected by breeze conditions. A long, slender balloon is preferable, if this shape can be obtained without a disproportionate increase in weight of bracing. The head end should be pointed. Ample steering power is absolutely essential. The necessity for a fuel of high heating value and light weight suggests the consideration for experiments of a gaseous fuel, perhaps hydrogen itself.

Vertical propulsion for altitude control involves mechanical difficulties and could be effective for a short time only on account of the expenditure of fuel, which would probably be more rapid than the expenditure of gas and ballast necessary to accomplish the same results. Equilibration in water begs the question, and while theoretically a perfect solution of the difficulties involves mechanical complications apparently insuperable.

The Sketchbook on Tours

ONE WAY IN WHICH AN AUTOMOBILE MAY BE UTILIZED TO GET ALL THAT THERE IS IN IT IN THE WAY OF HEALTH AND ENJOYMENT

TOURING in an automobile may be aimless gadding of little permanent value for mind or body or it may be one of the most intellectual and health-giving of pastimes. The incidents of a tour may form only a blurred and confused image in the memory, lacking in contours and definition. Scenes of beauty or of character and that wealth of ideas which streams through the mind when new things are passed in quick review may all, when the tour is over, have been wiped into one continuous mental smudge from which the strained recollection tries in vain to single out those details which at the moment seemed so deeply interesting, and which yet were swept into the ocean of oblivion by the too rapid succession of other new and perhaps equally interesting glimpses among the fleeting images and impressions.

But the tour may also be made into invigorating exercise of all the dormant faculties for enjoyment of life's diversity, leaving a lasting treasure of rejuvenating mental refreshment upon which the mind may draw at will, recalling on wintry indoor days what the summer or the glorious autumn of North America offers the modern stroller who goes forth fortified with motive power to gather during a week-end or in the scant days of vacation what former generations could scarcely obtain without setting aside months or even years for the purpose. Fresh and first-hand observations of their own country and people beyond the narrow circle of the home community.

An itinerary chained to a time schedule, a preconceived formula for road speed, a hectic desire for exploiting to the full the travelling capacity of the automobile are likely to turn touring into work, recreation into snobbery.

It has almost been overlooked that the automobile is superior to the horse and the railway train no less by its infinite patience for interruptions of its movements, for stopping and lingering at the roadside, than for its capacity in carrying the traveler from place to place, wherever he desires to go and at whatever pace he wishes to move. It is the unsentimental readiness of the photographic camera for snapping in a trice a scene replete with inexhaustible charms which snatches from the tourist all lasting impressions. The dry plate and the professional developer, by the bribe of an insidious convenience, rob the mind of its digressions; those leisurely digressions in which alone the mental pleasures grow to the stature of true recreations.

An antidote is wanted against the fatuous habit of the rush. The sketchbook supplies it. Not that the sketchbook can entirely supplant the camera, nor that it should. The automobile and the camera are the mechanisms. The brain and its culture, the sketchbook and a little practice, which quickly grows into artistic perception, are the esthetic instrumentalities through which the lifeless mechanisms are forced to contribute to that expansion of vitality that turns mere existence into life.

Commonly it is assumed that sketching is beyond the capacity of the average tourist. First attempts seem to confirm this no-

tion. The results, to one who has not himself a personal recollection of the pictured scene, falls below that of even a flat photograph. If one wishes to take views mainly for the purpose of showing them to others, the camera is just the thing. A hundred views can be snapped and only those which turn out creditably may be shown. There will still be more left than the sketcher can put on paper with pen and ink, or even only with his pencil, and there will be no sting of silent or spoken criticism. The camera is more useful to the professional artist than to the amateur seeking recreation. The amateur sketcher must find most of his reward within himself. His effort, however imperfect from a critically artistic standpoint, will recall to him all that his mind saw while he strove to express some semblance of it all in black and white; the colorings, the movements, the ideas and sentiments which were suggested will remain with him, though not on the paper, as a reward for his pains. Unlike the camera view, which was snapped one second and forgotten the next, the sketch has a memory value to him and his intimates, and if the delay incidental to the effort has compelled him, or her, to take along on the tour only those who are willing to pause when something captures the fancy of one of their number, the gain will be double. Artistic or esthetic pleasures may be gathered in solitude but not in uncongenial company, be it the closest of kin. If the sketching habit reduces touring company to the natural affinities, this alone will be a more valuable enhancement of the charms of touring than the camera has ever conferred.

The doubting mind reverts, however, to the belief that skill in sketching, even of the most modest pretensions, can be acquired only as the result of long and serious preparation. This is the misunderstanding which must be first removed. There are modes of expression for constantly recurring themes and details which it is well to learn manually, so that the hand shall not be tediously delayed in the choice of lines. And there are knacks and habits in fixing the mental image before drawing the firm line with pen and ink which it is better to acquire rapidly and systematically through the aid of an artistic teacher. But, on the whole, the ability to sketch for one's own satisfaction is an education of the eyes and mind rather than of the hand. As soon as the eyes can see, the hand can draw. A few efforts at the roadside, guided by a firm determination to avoid erasure, teach the eyes to see and the hand to obey. The fourth attempt of the beginner, if he is only determined, is already immeasurably in advance of the first. Pen and ink force the learning more rapidly than the pencil because erasure is so evidently impracticable. Large size with open work, aimed to express what the eye sees in the fewest possible lines, trains the arm to round and easy movements. But nobody should look at the amateur sketcher in his first timid efforts; he needs all his concentration. Gradually but rapidly skill creeps into his fingers. His eyes see more than they saw. Where he fumbled at first he becomes energetic. Difficulties begin to stimulate him. The artistic perception takes possession. He gets more and more dissatisfied with his work and more and more contented with having done it. Perhaps he tears it up after it is completed, sacrificing it to the vanity which works within the self. But the residuum of the doing remains with him, the deep-graven memory and the skill.

Before very long the camera may be his friend and helper, but the sketchbook has become his inamorata. He becomes jealous of its pages and more than willing that nobody should ever see them but himself and the few with whom he is ready to share his emotions and lay bare his foibles. Much of the life that stirs in the early morning and at sunset time, when mist and red rays blind the optics of the camera, is his for the taking, and at all times it is his privilege to leave out the unessentials which muddle many a photographic view.

The touring season is over, except, of course, for the sturdy souls to whom temperatures are mere expressions of Nature's moods, all to be equally though differently enjoyed. Thousands of men and women will recapitulate in their home surroundings hasty impressions from the hurried trip to which they devoted the heydays of the season's leisure. But from the stacks of photographs only one or two views will quicken the beat of memory. Something better can be done next season, and the meantime may be utilized to lay the foundation for a sketchbook; a little earnest practice indoors and outdoors on the fine days of Winter; a little apt tuition to ease the beginnings. Automobile touring seems to be peculiarly called to help in establishing a refreshing collaboration between art and recreation, for the benefit of both. And while the tourist's sketchbook will rarely contain artistic revelations of gripping force or wholly intrinsic value, it seems capable of becoming not only a potent accessory for the enhancement and intensifying of automobile pleasures, but in still larger degree a strangely timely means for self-education of those dormant artistic perceptions among the public, whose development is indispensable if artistic production of high merit shall be called into life and find an appreciative clientèle, whether applied to the free arts or to works of industry and engineering.

Is the Automobile an Economic Blunder?

Ferdy (having dinner with his side partner of the ribbon counter)—How do you manage on your small salary to have such nice fowl, a wide variety of vegetables and other nice things; I am single, as you know, and it is all that I can do to make both ends meet.

George—I own an automobile.

Ferdy—What has that to do with it more than to complicate the whole situation?

George—Well, it has this to do with it: I have not had to buy a chicken or a duck since I owned it.

Ferdy—Do you run over celery, potatoes, beets, pumpkins, apples, etc., too?

George—No, they grow by the side of the road and they are so tame that I walk right up and take them.

The Adams 1911 Line

INCLUDING MODEL C, A FIVE-PASSENGER TOURING CAR; MODEL B, 1,000-POUND DELIVERY, AND MODEL A, A ONE-TON TRUCK

ACTIVITY seems to be rife in the automobile business, and the latest comer among the makers of cars is the Adams Brothers Company, of Findlay, Ohio. This company is building gasoline automobiles for passenger and freight service, and it announces the Adams "30," which is known as Model C, and is designed as a five-passenger touring car. Among the freight automobiles Model B is a 1,000-pound delivery wagon, and Model A is a one-ton truck.

With a view to showing the type of equipment that is being built and used in Adams automobiles, reference may be had to the Model C power plant, as shown in Figs. 3, 4 and 5. Fig. 3 presents the right-hand side of the motor showing monobloc cylinders C1 with a bore of 3 7-8 and a stroke of 5 inches, there being a space between the cylinders C2, C3, C4 and C5 below the waterjacket, and the jacketing above is so contrived that the block presents a symmetrical appearance, and a liberal space is

provided for the water circulation, with a manifold head M1 serving as a cover with its connection to the radiator, which is placed to the rear in the plane of the flywheel. This is a departure from customary practice, and it permits of placing the air-fan F1 to the back, and the utilization of a heavy-rimmed flywheel F2 with a solid web. Moreover, the magneto M2 is located on a lateral shaft in front, bringing the same to the right side, locating it upon a ledge L1, which is cast integral with the half-time gear housing. The Kingston carbureter C6 is located amidships on the right-hand side and is connected by means of a short manifold M3 to the facing for the transfer port in such a position that the hot water of the jacket helps to volatilize the spray in gasoline mixture, and the work that the carbureter does under these conditions is on an efficient basis.

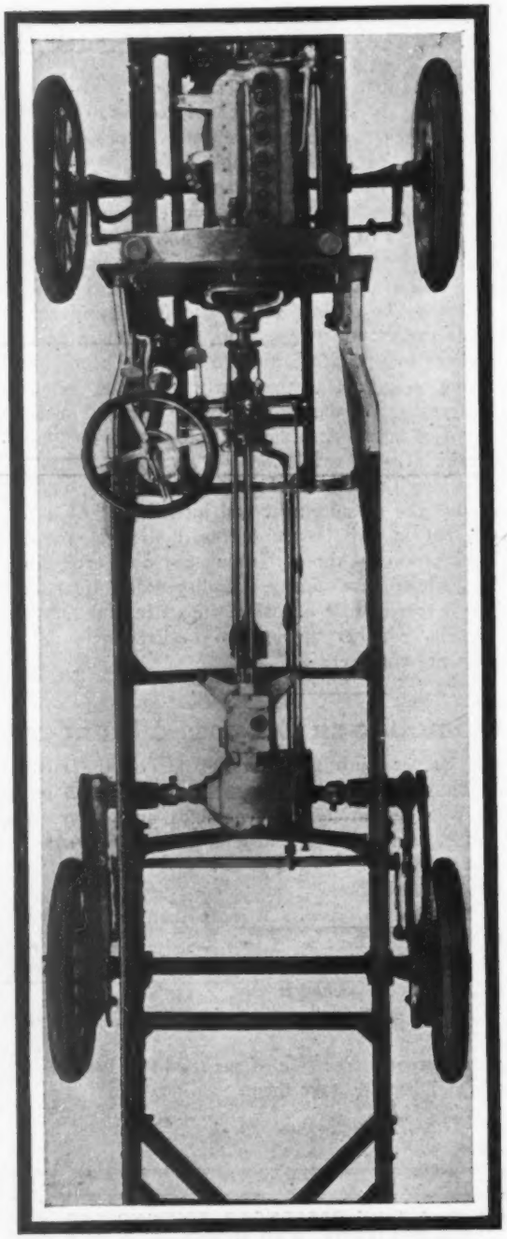


Fig. 1—Plan of the Model "A" one-ton truck chassis, showing the block motor on front, radiator back of the motor, and the transmission gear, including the differential as a unit with the jackshaft, the latter having universal joints and arranged for a side chain drive

Referring to Fig. 4 of the left-hand side of the Model C motor, it will be observed that the water pump W1 rests upon a ledge L1 at the front end, and is driven by the lateral shaft, the other end of which delivers power to the magneto. The cylinders are cast with T-heads, bringing the valve mechanisms to this side of the motor, and a Kellogg pump P1 is fastened to the upper half of the crankcase, taking its drive through a shaft from a gear train, the latter being located just in front of the flywheel. The crankcase is in three parts C1, C2 and C3. The part C3 is scooped out to form a sump for the lubricating oil, and the oil pump P2 is located at the front end of the motor, with its housing cast integral with the lower part C3 of the crankcase. This pump is driven by means of a vertical shaft, taking power from a suitably contrived gear within the half-time case. Water flows into the pump W1 by gravity and is forced through the manifold M1 to the jacket of the cylinders C1. The Kellogg pump is available for the purpose of inflating tires and to whatever use a reliable and ever-ready supply of air may be put.

Referring to Fig. 5 of the Model C motor, a better view of the oil pump P1 may be had; the magneto M1 comes into bold relief, and the water pump W1 shows clearly on the opposite end of the shaft S1, the latter being driven by a suitably contrived gearset within the half-time gear case.

The general design of the motor is in keeping with the high aims of the company, and the clean appearance it presents is to some extent due to the casting of the inlet and exhaust manifolds integral with the block cylinders, and the good result expected of this motor is more or less chargeable to the water-jacketing of the inlet and exhaust manifolds, it being a reasonable expectation that the heat should be abstracted from the

SPECIFICATIONS OF THE ADAMS PASSENGER AND FREIGHT AUTOMOBILES

MOTOR DATA	SPECIFICATIONS	MODEL C	MODEL A	MODEL B
	Horsepower	30	25	16
	Bore	3⅞	3¾	3⅞
	Stroke	5	5	5
	Number of cylinders	4	4	2
	How cast	Enbloc	Enbloc	Enbloc
	How cooled	Water	Water	Water
COOLING SYSTEM USED	Type of radiator	Tubular	Tubular	Tubular
	Type of pump	Centrifugal	Centrifugal	Centrifugal
	Kind of piping	Aluminum	Copper	Copper
MAKE AND TYPE OF CARBURETER USED	Make of carbureter	Kingston	Kingston	Kingston
	Type of carbureter	Float	Float	Float
	What side of motor	Right	Left	Left
	Heated with	Water	Water	Water
MAKE AND TYPE OF MAGNETO USED	Make of magneto	Eisemann	Eisemann	Eisemann
	Type of magneto	H. T.	H. T.	H. T.
	What side of motor	Front	Front	Front
LUBRICATING SYSTEM AND TYPE OF EQUIPMENT	How oiling is done	Positive	Positive	Positive
	Make of pump	Own	Own	Own
	Type of pump	Gear	Gear	Plunger
	Location of pump	Front	Front	Front
	Capacity of oil tank	2 Gals.	2 Gals.	2 Gals.
TYPE AND LOCATION OF CLUTCH	Make of clutch	Own	Own	Own
	Type of clutch	Cone	Cone	Cone
	Kind of facing	Leather	Leather	Leather
	Location of clutch	Flywheel	Flywheel	Flywheel
TYPE OF TRANSMISSION GEAR	Make of transmission	Own	Own	Own
	Number of speed changes	3-Speed	3-Speed	3-Speed
	Selective or progressive	Selective	Selective	Selective
	Location of transmission	On Frame	On Frame	On Frame
	Location of control levers	Right Hand	Center	Center
TYPE AND DETAILS OF REAR AXLE	Type of rear axle	Floating	Floating	Floating
	Ratio of reduction	3½:1	8:1	5:1
	Type of differential	Bevel	Bevel	Bevel
	Shaft or chain drive	Shaft	Chain	Shaft
DETAILS OF EMERGENCY AND SERVICE BRAKES AND CONTROL LEVERS	Location of service brakes	Rear Wheels	Jack Shaft	Rear Wheels
	Expanding or constricting	Constricting	Constricting	Constricting
	Location of emergency brakes	Rear Wheels	Rear Wheels	Rear Wheels
	Expanding or constricting	Expanding	Expanding	Expanding
	Facing of service brakes	Raybestos	Raybestos	Raybestos
	Facing of emergency brakes	Raybestos	Raybestos	Raybestos
	Location of service brakes control	Pedal	Pedal	Pedal
	Location of emergency brakes control	Side	Center	Center

exhaust manifold to keep it cool, and the same heat is wanted to boil the liquid gasoline as it passes up in spray form from the carbureter en route to the combustion chambers of the motor's cylinders. Besides a well-regulated compression on a basis of flexibility of performance, the pistons are made from a good mixture of gray iron, and besides being ground to obtain an accurate fit, they are provided with ground-to-size rings of the same material. The crankshaft is of 3 1-2 per cent. nickel steel and the bearings in addition to being of a fine grade of bearing composition are scraped in. The camshaft is drop-forged with integral cams, is completely enclosed in the upper half of the crankcase, driven by a spiral gear, and profusely lubricated. The valves are interchangeable in size, located on the left-hand side of the motor, and are so designed, using alloy steel, that distortions due to heat are aborted. The crankcase is of aluminum, and the upper half is self-contained with the working parts of the motor, while the lower half is reduced in its responsibility to the holding of lubricating oil and the exclusion of foreign substances.

The plan of lubrication includes a well-regulated splash and a force-feed oiling system combined. The oil pump is of the gear type and is so located with respect to the oil well that there is no suction head; in other words the oil flows into the pump, and the piping from the oil pump is of copper of generous diameter, connecting with channel ways suitably directioned, cast integral with the upper half of the crankcase. A constant oil level is maintained at the bottom of the crankcase, and special means of regulation of the oil supply are provided. The water pump of the centrifugal type is driven by a spiral gear, and the plan throughout is to obtain noiselessness of performance by the use of well-proportioned spiral gears wherever the occasion requires, coupled with a positive supply of lubricating oil. The location of the radiator back of the motor augurs for accessibility of the magneto and pump at the front, and the arrangement is such that the belt-driven air propeller of large capacity affords a sufficient supply of air to take away the heat which is absorbed by the water on the exterior of the flame-swept surfaces of the motor. The radiator is of the vertical tube type, carried on flexible supports, the latter being of the ball and socket type with a spring buffer, thus indicating a certain flexibility of the mounting and preventing radiator trouble due to the working of the chassis frame.

The magneto is of the high-tension Eisemann make, it being optional with the purchaser to accept the single, dual or double

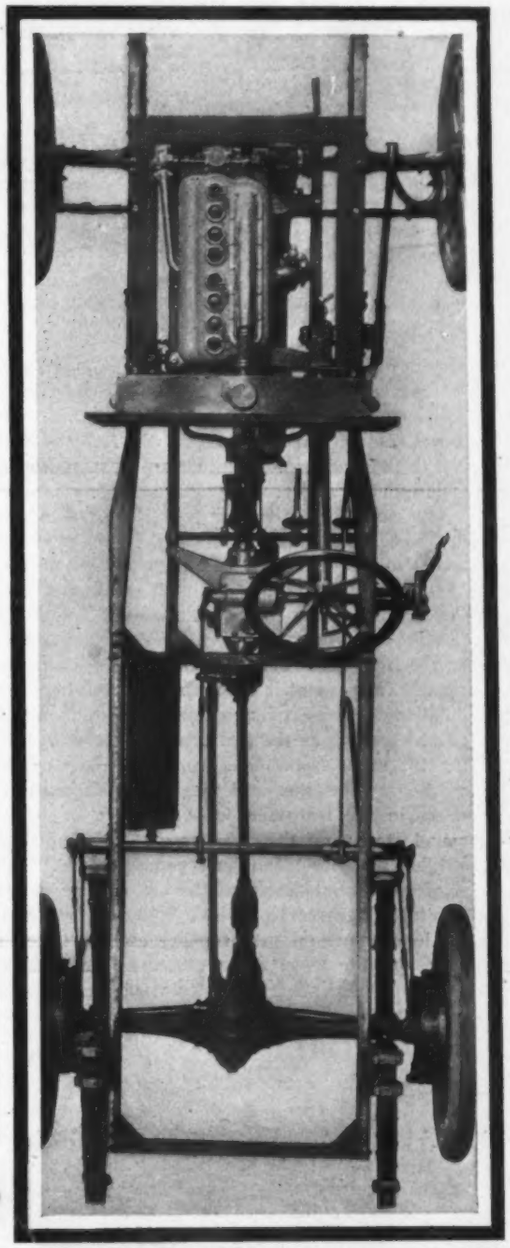


Fig. 2—Plan of the Model "C" chassis, showing the block motor in front and the three-speed selective transmission on a common sub-frame, with universal joints for the tumble shaft between the motor and the transmission and the propeller shaft leading to the live rear axle

SPECIFICATIONS OF THE ADAMS PASSENGER AND FREIGHT AUTOMOBILES

	SPECIFICATIONS	MODEL C	MODEL A	MODEL B
DIMENSIONS IN INCHES OF FRONT AND REAR SPRINGS	Type of rear springs	¾-Elliptic	½-Elliptic	½-Elliptic
	Width of plates	2¼	2½	2¼
	Span of springs	44	44	45
	Type of front springs	½-Elliptic	½-Elliptic	1½-Elliptic
	Width of plates	2	2¼	2
	Span of springs	36	44	36
TYPE, MAKE, AND DATA OF FRONT AXLE	Type of front axle	I-Section		
	Front or rear location of cross rod	Rear	Rear	
	Steel casting, or drop forging	Forging	Forging	Forging
	Drop, or straight axle	Drop	Drop	Drop
DIMENSIONS OF SIDE FRAMES	Type of side frame	Channel	Channel	Channel
	Shape of section	Channel	U	U
	Straight, double or single drop	Double	Straight	Straight
DETAILS OF THE WOODWORK WHEELS	Type of front wheels	Artillery	Artillery	Artillery
	Number of spokes	12	12	12
	Type of rear wheels	Artillery	Artillery	Artillery
	Number of spokes	12	12	12
	Cast, or forged hubs	Forged	Forged	Forged
DATA OF RIMS USED	Type of rims	Optional	For Solid Tires	For Solid Tires
	Make of rims	Solid		
	Designed to fit what tires	34 x 3½		
MAKES AND TYPES OF THE BEARINGS USED IN	Make of crankshaft bearings	Plain	Plain	Plain
	Type of crankshaft bearings	Plain	Plain	Plain
	Type of camshaft bearings	Plain	Plain	Plain
	Make of gearbox bearings	H-B	H-B	H-B
	Type of gearbox bearings	H-B	H-B	H-B
STATEMENT OF TIRE EQUIPMENT REGULARLY USED	Make of rear wheel tires	Diamond	Diamond	Diamond
	Diameter of rear wheel tires	34	34	32
	Section of rear wheel tires	3½	3½	4½
	Make of front wheel tires	Diamond	Diamond	Diamond
	Diameter of front wheel tires	34	34	32
	Section of front wheel tires	3½	3½	4½
GENERAL INFORMATION RELATIVE TO ROAD WORK	Length of wheelbase	118	120	104
	Tread of wheels	56	56	56
	Maximum speed in miles per hour		15	20
	Gallons of gasoline tank capacity	20	20	20
PRICES WITH PASSENGER OR FREIGHT BODIES	Price of chassis only		$2,400	$1,600
	Price with touring body	$2,000		

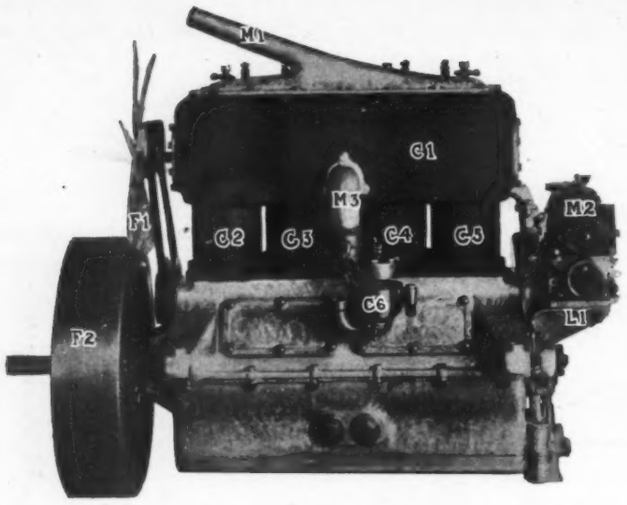


Fig. 3—Right-hand side of the "Thirty" motor as used in the Model C touring car

system of this make of magneto. The spark and throttle control is mounted on the steering wheel, and owing to the favorable relation of the magneto, as it is located in front to the steering wheel coming in the same side, the linkages and levers connecting the magneto with the control are reduced to the least possible number, and are of the straight line design.

The clutch is of the cone type, leather-faced, and located in the flywheel. The clutch spring is so mounted that an adjusting nut comes to the outside, thus making it possible to alter the tension of the spring to suit the clutch conditions, as time may affect the leather facing. The transmission is of the selective type, three speeds forward and one reverse, arranged for direct drive on the high gear. The transmission is located amidships on the chassis frame, and is connected to the motor by a tumble shaft involving the use of two universal joints. A subframe is employed serving as the platform for the power plant, thus relieving the same from the spiral contortions of the chassis frame as it interprets the road inequalities through the springs. The gears in the transmission system are of heat-treated chrome-nickel steel, and the spindles, of like material, float on Hess-Bright (D. W. F.) annular type ball-bearings. The live rear axle is of substantial design of the bulged type in one piece with the differential gearset and bevel drive located amidships, and when the load comes on the propeller shaft between the transmission gear and the bevel drive is quite free from angularity. The chassis frame is of pressed chrome-nickel steel, offset between the front wheels with a kickup at the rear to give clearance, and

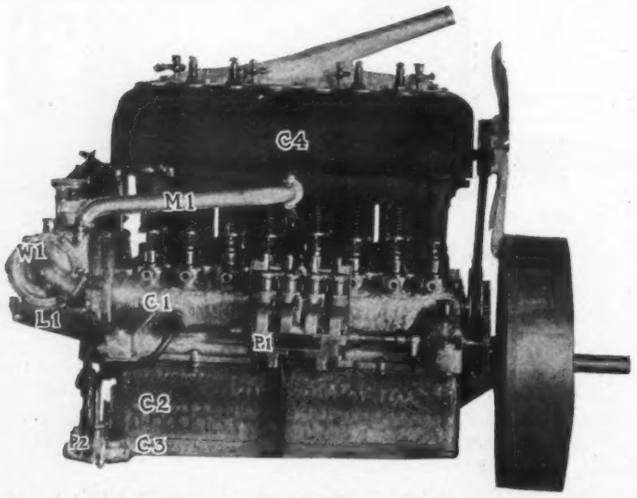


Fig. 4—Left-hand side of the Model "Thirty" motor, showing the Kellogg air pump in place

is suspended on three-quarter elliptic springs at the rear and half-elliptic springs at the front. To contribute to the easy riding qualities, and to avoid spring breakages, the rear springs have plates 2 1-4 inches wide, with a span of 4 inches, and the front springs have plates 2 inches wide, with a span of 36 inches. The springs are of vanadium steel.

The wheels are of the artillery type, designed for 34 x 3 1-2 inch pneumatic tires, and the two sets of brakes, one for service and the other for emergency, act on a suitably contrived drum attached to the rear road wheels. The wheelbase of the car is 118 inches with a tread of 56 inches. The equipment includes two electric and oil side and tail lamps, also a tire repair outfit, set of tools, jack, horn, not forgetting the Kellogg air pump for the tires, and the price of the automobile complete, is $2,000.

What Must Automobilists Do to Dampen Sound

If it may be taken for granted that the automobilist will express a preference for a noiseless performer when he is making

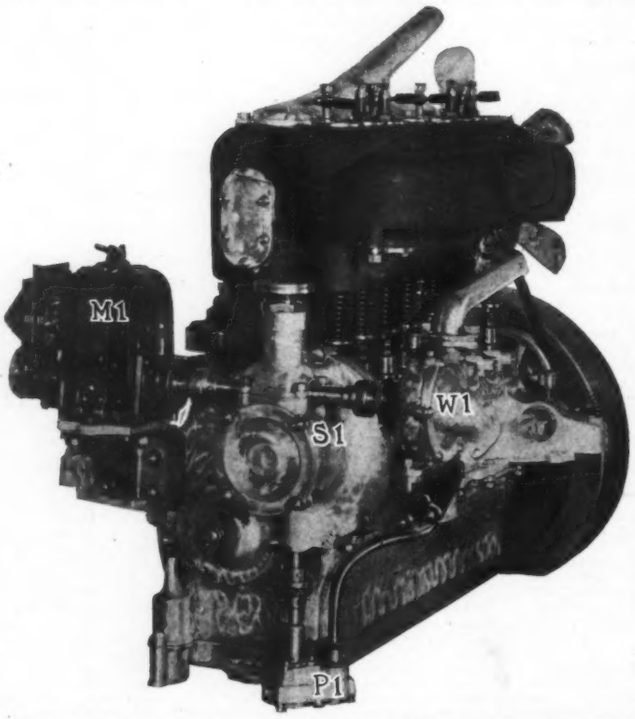


Fig. 5—Front end view of the Model "Thirty" motor, showing the magneto and pump on a cross shaft and the oil pump on a vertical shaft

his purchase; if he will take his demonstration in the vicinity of a cemetery instead of alongside of a boiler shop, it still remains for him to be hospitable to his dumb relations.

It is a great misfortune that the bulldog tenacity of the proverbial mother-in-law is on the side of noise in an automobile rather than as the ally of silence. What a grand thing it would be were it possible to fix upon a condition of silence in a car that would be so constant of attention as this proverbial mother-in-law; she who dabbles in the fag-end of the honeymoon and sticks to her post, as if of duty, to the very day when the poor chap succumbs, let us say, to the black plague; but who knows best? Might it not be just a plain case of noise emanating from a machine that resists muffling.

The honeymoon of a sweet-running automobile begins with a proper selection, of course, just as it does in other walks. When the knot is tied there still remains the duties which perpetuate a favorable condition, a clean and wholesome atmosphere, a discriminating type of diplomacy, let us say—good lubricating oil. But carelessness even in the use of the oil makes for a condition of indigestion that cannot be tolerated for long.

Rational Road Regulations

PREPARING A FOUNDATION FOR UNIFORM AND JUST AUTOMOBILE TRAFFIC REGULATION—SIGHT AND SOUND SIGNALS (FINAL INSTALLMENT)

Assuming that the object of regulation of traffic is in all cases the furtherance of tranquil conditions, the possible causes of disturbance may be divided into five classes, those originating with (A) the driver, (B) the vehicle and its makers, (C) pedestrians and other traffic members, (D) the State and its officials and (E) public opinion as vented in the public press.

A.—The driver may be of (1) an insolent disposition and constitutionally inclined to run roughshod over those upon whom he looks down as inferior beings. He may be (2) inebriated and thereby temporarily deprived of decency, common sense and the full use of his physical faculties. He may be (3) permanently deficient, having poor sight or hearing or being subject to nervous collapse in emergencies.

B.—The vehicle may (4) possess peculiarities affecting the driver's actions and faculties. It may be (5) faulty in its control elements. It may be (6) of appearance so odd as to scare horses, or it may be (7) used in districts where any automobile scares horses. It may (8) possess certain peculiarities through which its speed or the direction of its motion fails to be accurately or quickly perceived by the average person.

C.—Pedestrians and drivers of vehicles in the traffic, including drivers of automobiles, may be (9) insolent and inclined to make trouble. They may stubbornly insist that the slow member of the traffic has as good a right to all of his slowness as the automobile driver has to some of his speed. They may be (10) inebriated. They may be (11) deficient, having poor sight or hearing or both, or being subject to nervous collapse in emergencies. They may be (12) unaccustomed to the sight of automobiles.

D.—The State, through its officials, may be (13) poorly informed (14) venal or biased, with all the results flowing from such condition in the way of bad laws, poorly enforced laws, exasperation of the traffic members, including the automobile drivers, contempt for all regulation, tricky legal quibbling on technicalities. The State may be (15) poorly organized for the enforcement of laws.

E.—The public press which voices and shapes public opinion may be (16) following false channels, catering to class interests or failing to spread information of essentials when these lie beyond the horizon of the average reader.

WHEN it is noticed that drivers of horse-drawn vehicles and steam vehicles and riders of bicycles, as well as pedestrians, frequently choose to move very slowly indeed, because the slow movement gives them a special pleasure, and that, on the other hand, drivers of gasoline vehicles never willingly choose any slower gait than that which is the constitutionally most favorable gait for their machine, the probable mental influence on the driver and incidentally upon the security of the traffic of the factors mentioned may be gauged and appreciated, even while full recognition is given to the fact that the gasoline vehicle has been wonderfully improved and offers the driver means which, if employed, would enable him to drive with all due consideration for other traffic members. The means are there, but they are not agreeable to the vehicle's mechanical or the driver's mental constitution. When one is looking for remedial action in this situation it should perhaps be considered in the first line that commercial competition prevents any manufacturer from incorporating in his product devices which would make the control more laborious or complicated than the means at present employed, and that any devices calculated to impede speed or reduce power constitute an incubus on a progressive movement and a limitation of personal liberty, which should be avoided if possible. Only the further development of the service brake of very gradual and progressively effective application, on the lines of multiple plate clutches running in oil, and capable of slipping much without heating, seems to promise acceptable results without unacceptable compulsion.

A brake sufficiently nicely graduated to admit of applying it against the motor power without any danger of interference with the motor functions, and operating to withdraw the clutch only when the brake effect begins to approximate the pressures which would actualize this danger, could probably be constructed by having the throttle control and the gear shift, both, connected with the brake pedal in such manner as to increase the range of brake pressures according to the amount of power delivered by the motor to the driving shaft or chains, while the withdrawal of the clutch, in case of a severe braking effort being required, would throttle the idle motor to its minimum speed for the moment. An arrangement of this nature, which does not vary radically from present practice in the mechanical expedients required for materializing it, would practically limit the control movements necessary for safeguarding the traffic, and for running slowly and yet at ease, to steering and braking; the clutch pedal being at the same time available, as now. The mechanical perfecting of brake arrangements—acting on the transmission and against the motor at the low brake pressures—can, however, of course not be forced by law, and any construction less than practically perfect could not successfully be made obligatory by law. A commission of special competence in automobile engineering as well as in understanding of the mental principles involved, if it took up the views here presented or chose other mechanical methods for meeting the requirements, would at this point probably find it necessary to offer prizes for suitable construction and otherwise to proceed as mentioned under No. 8 with reference to sight and sound signal devices. Doubtless, legislative interference is particularly difficult with regard to this or any other matter having to do with essentials of construction, materials, workmanship and adjustments, but it remains true, on the other hand, that some action of a public character must be depended upon to remedy the existing defects in the "constitution" of the gasoline vehicle, if natural competition cannot be relied upon to start the ball rolling in the required direction. And much may be gained by giving impetus to the least onerous and most rational improvement demanded in the interest of traffic security, rather than waiting till irrational and odious devices for restricting speed or power, or both, are imposed indeed.

Speed restrictions, which may be absolutely sound and advisable in the dealings between the owners of trucks or cabs with their hired drivers, and which for better enforcement may with entire propriety be incorporated in the construction of this class of vehicles—as by the device known as *frein-moteur*—have already been shown to be highly objectionable as part and parcel of a legal system, having developed a vicious tendency toward the acceptance, by the lower courts and public opinion or the press, of low and lawful speed as *prima facie* evidence of proper caution and absence of guilt, to the neglect of all other considerations.

A brake acting automatically to stop a car unless held out of engagement by the driver's foot, and therefore compelling positive attention all the time and involving a certain amount of physical hardship at least equal to that of holding the reins over a horse, would seem to be among the mechanically feasible devices which might be demanded for the sake of secure traffic, if nothing more agreeable to automobile drivers and equal in quieting effect is volunteered.

(5) Faulty control elements. The condition of wearable parts, especially the steering system, the clutch and the brakes, but perhaps also the tires, should probably be examined in all cases of traffic disturbance. Perhaps manufacturers should be required to give with each car, and in a prescribed form, a description of its construction together with rules for proper maintenance of the important adjustments. And in case of conflicts in the traffic this document might be made the basis for the examination of the car's condition by some suitable public official charged with this duty in addition to his other work.

If some manufacturer were to try to accommodate customers—with a view to the traffic responsibilities of the latter—by stating the permissible play for adjustments higher than it can

be with safety, he would run into a mess of responsibilities himself, the danger of which would obviate repeated errors in this direction.

Culpable neglect as to the running order of the car would of course influence the court's decision, whether the question was one of damages or of penal responsibility. The same document used as a compulsory bill of sale would make it difficult to dispose of stolen automobiles.

(6) Odd appearance, likely to scare horses. Common sense would seem to be sufficient to take care of all cases of this kind, provided it is only recognized that the employment of scary horses in districts where automobiles are common is contrary to the established and lawful order of things in almost the same degree as an uncontrollable automobile or a drunken driver.

(7) In districts where automobiles are rarely seen, the road rights of other traffic members predominate by virtue of the privileges usually accorded to established modes of action as against innovations, and it seems that a paragraph in a traffic statute adopted by all States could recognize the principle that especial caution and consideration is to be expected of automobile drivers in such districts, the interpretation of this paragraph by local magistrates serving to draw the lines of caution and responsibility more sharply than elsewhere. Possibly the applicability of the paragraph might be made to hinge upon the number of automobiles owned or operated or taxed in the county on the last preceding date of public fiscal accountings.

(8) This refers to sight and sound signals and has been discussed at length.

(9) Insolent pedestrians, drivers of horses or other members of the traffic who wilfully obstruct the road. Everything said under No. 1 with regard to insolent automobile drivers would seem to apply. A general betterment of traffic conditions may be relied upon to remove irrational actions, which are largely due to irritation, leaving only a few plain cases of crime or misdemeanor to be handled under the general conditions for the enforcement of law and order.

(10) Intoxicated non-automobile traffic members. The mutuality which is the keynote to harmony in civilized life imposes upon the non-automobile traffic members certain new obligations toward sobriety on public roads, the moment it is recognized that these roads are open for automobiles on even terms with other vehicles and pedestrians. And recognition of the principle that intoxicated persons can claim no special consideration except in so far as their helpless condition may be plainly noticeable at some distance, would seem to be a timely concession to modern traffic conditions, with reference to those instances where the intoxicated person (or persons who have placed themselves in the keeping of an intoxicated driver) becomes the victim of his own abnormal state, while the principle of the "Continuity of Mental Responsibility," as referred to under No. 2, should eventually take care of those other cases in which the intoxicated driver of horses causes damage or injury to others. That it is just as nearly impossible to separate an automobile traffic statute from the general traffic laws and customs as to separate the automobile traffic itself from the other traffic seems at this point to become fairly apparent.

(11) Physical or mental defects in the non-automobile traffic members. The adoption of continuous sight and sound signals for automobiles should greatly reduce troubles due to this cause. But something more may be done, when it is recognized that observation and caution should be made as easy as possible for the automobile driver as well as for other traffic members, especially in the cases when the latter are in some manner deficient and handicapped in looking out for themselves. Tail lamps as well as front lamps, at night, on all vehicles are now voluntarily used where automobiles are numerous—for self-protection. And in some other places they are prescribed by statute or ordinance. Their use should, it seems, be made obligatory everywhere. Custom has from time immemorial sanctioned bells for sleighs, in view of the noiseless progress of such vehicles over the snow, and they are used for the muleteams drawing cumbersome loads over narrow mountain roads, to the end that other travelers may hear them from afar and may turn off and halt at some convenient siding, to let them pass. These amenities, which special circumstances rendered necessary or useful before the automobile came into the traffic, there might perhaps be reason for reintroducing more generally now, on the ground of the change in the character of the traffic which is due to the automobile. Eventually, when automobiles become absolutely predominant everywhere, it seems self-evident that not only the necessities but also the amenities and the mind-ease of the traffic will require to be suitably developed, as it cannot be the intention to inaugurate a cruder civilization than that which is being replaced so rapidly. From this point of view, a sound signal of some kind, to be used under all circumstances when a soft roadbed, sharp turns, darkness or high hedges make observation difficult, should probably be recognized as an equipment which any reasonably cautious driver of horses might be expected to use—more particularly if he suffers from defects which may throw the whole burden of caution or quick action upon the driver of the automobile.

(12) The traffic members may be unaccustomed to the sight of automobiles. This situation is evidently the same as that discussed under No. 7.

(13) State officials, legislators, magistrates, road supervisors and the police may be poorly informed, Practically exclusive attention to speed and speed restrictions from one year's end to the other naturally results in a deficient understanding of all the neglected factors relating to the security of the traffic. And the occasional interpolation of appeals from class interests, in the case of the legislators, do not seem to bring out a disinterested or circumspect discussion of the whole subject. Neither does the examination of the records and qualifications of professional drivers seem to bring out anything touching the core of the difficulties. On the other hand, the work of a competent commission, with subcommissions and other ramifications, conducted with liberal publicity and including consideration of all the neglected elements in traffic regulation, as outlined in this article, tentatively, could scarcely fail to contribute strongly to a general dissemination of fresh ideas.

(14) Venality or bias among the same officials referred to under No. 13. It is perhaps generally conceded that the best guarantee against venality lies in the absence of opportunities and in the criticism which may be expected when correct information is general. The measures outlined seem to meet these requirements. Mere bias would be disarmed by a statute essentially just to all.

(15) State poorly organized for enforcement of laws. This cause for traffic trouble is largely met by having a law which is easily enforced and so reasonable that no general sentiment can arise against its impartial enforcement.

(16) Public opinion and the press. Probably no better method for causing public opinion to form and express itself rationally and helpfully could be devised than that consisting in placing the deliberations, progress and conclusions of a competent commission (having power to supplement itself with all needed specially trained assistance), at the disposal of the press, particularly as the work of a commission would consume a considerable time and the purpose of uniting all States under statutes of identical wording would extend the public interest to all parts of the Union.

Synopsis

The principal features of a statute intended to regulate traffic on public roads and streets with a maximum of safety, liberty and mind-ease for all are conceived as follows:

The statute to govern questions of civil and criminal responsibility arising from all traffic on public roads and streets, subject to interpretation under the general laws of the State, except in so far as these may conflict with its provisions.

No speed restrictions, excepting that no one shall drive any vehicle faster than attending circumstances warrant.

No licensing of drivers, except locally for public vehicles.

Compulsory equipment of automobiles with "continuous sound and sight signals." Approved types of these to be described in detail (when determined upon).

Recognition of the principle that intoxication of one who drives an automobile constitutes criminal carelessness "in the first degree" and aggravates civil and criminal responsibility in the case of traffic trouble.

Recognition of the principle that intoxication of any person participating actively in the traffic on public roads constitutes criminal carelessness "in the second degree" and aggravates civil and criminal responsibility in the case of traffic trouble.

Recognition of the principle that those deficient of sight or hearing or proved to be lacking in quick mental and physical responsiveness in emergency situations shall exercise more than common caution when driving automobiles or other vehicles, and that such deficiency, according to its degree, shall determine criminal carelessness in case of traffic trouble resulting wholly or in part from it.

An obligatory control system for automobiles, by which drivers will be encouraged or mentally prompted to forestall emergency situations by suitable previous control action. Approved types of the mechanism of control to be described in detail (when determined upon).

Rules for rapid determination of the mental and physical condition of persons arrested by reason of traffic disturbance.

In each automobile to be found, in prescribed form, a description of its construction with methods and measurements for properly adjusting its control elements. On the same document to be recorded, in attested signatures, name and postoffice address of each successive owner of the vehicle, with date of purchase. The owner of an automobile to be liable for damages or penalty, or both, if any person or property is injured wholly or in part through its faulty condition.

In case of traffic disturbance coming before a court for adjudication, the court at once to have the condition of each vehicle implicated in the disturbance examined. The examination, in the case of automobiles, to be made with reference to the measurements indicating proper adjustment of its control elements and to be made without fee by a competent employee of the community in which the disturbance has taken place. Rules to be given for the previous appointment of persons for this work.

Recognition of the principle that the use of draft animals that become uncontrollable—with reference to the driver's ability to control them—in the proximity of automobiles in districts where automobiles are common, constitutes evidence of gross carelessness.

Recognition of the principle that extraordinary caution is the duty of drivers of automobiles in districts where automobiles are rarely seen. In case of doubt, any district to be held to come in this class, if less than five automobiles are owned or taxed in the county.

Lighted front and tail lamps, of described effect and colors, to be obligatory for all vehicles after sunset and under other circumstances when similarly needful.

Recognition of the principle that ordinary vehicles, as well as automobiles, shall be provided with sound signals operating under all circumstances which render difficult a prompt observation of the presence of such vehicles in the road.

Violation of any provision of "this enactment" to be prosecuted under the general laws of the State and the penaltities to be determined by the court of jurisdiction in analogy with law and precedent relating to other transgressions.

As it seems that the system of registering and numbering automobiles must eventually disappear or become much modified, in proportion as automobiles become the normal means for road locomotion and other vehicles the exception, no reference has been made to this system which may exist under different forms in the different States without serious interference with the efficacy of the general traffic law, to which it relates only as one of the means for securing enforcement.

Coming Events

CALENDAR OF FUTURE HAPPENINGS IN THE AUTOMOBILE WORLD THAT WILL HELP THE READER KEEP HIS DATES STRAIGHT—SHOWS, ANNUAL MEETINGS AND OTHER FIXTURES

Jan. 28-Feb. 4	Chicago Coliseum, Tenth Annual National Automobile Show Under the Auspices of the National Association of Automobile Manufacturers, Inc., Pleasure Cars and Accessories, Exclusively.
Jan. 30-Feb. 4	Troy, N. Y., Annual Show, Troy Automobile Club, State Armory.
Feb. 6-11	Chicago Coliseum, Tenth National Automobile Show Under the Auspices of the National Association of Automobile Manufacturers, Inc., Commercial Vehicles, Pleasure Cars, Motorcycles and Accessories.
Feb. 6-11	Buffalo, N. Y., Ninth Annual Show, Automobile Trade Association of Buffalo. Broadway Arsenal.
Feb. 7-11	Worcester, Mass., Annual Show, Licensed Automobile Dealers Association of Worcester.
Feb. 9-11	Davenport, Iowa, Second Annual Show, Davenport Automobile Club.
Feb. 13-18	Washington, D. C., Annual Show, Convention Hall.
Feb. 13-18	St. Louis, Mo., Fifth Annual Show, Coliseum.
Feb. 13-18	Winnipeg, Man., First Annual Show, Winnipeg Motor Trades Association.
Feb. 13-19	Kansas City, Mo., Annual Show, Motor Car Trade Association.
Feb. 14-19	Dayton, O., Second Annual Show, Memorial Building.
Feb. 15-18	Grand Rapids, Mich., Annual Show.
Feb. 18-25	Minneapolis, Minn., Annual Show, Minneapolis Automobile Show Association, National Guard Armory.
Feb. 18-25	Brooklyn, N. Y., Annual Show, Brooklyn Motor Vehicle Dealers' Association, 23d Regt. Armory.
Feb. 18-25	Binghamton, N. Y., Second Annual Show, Binghamton Automobile Club and Chamber of Commerce, State Armory.
Feb. 18-25	Newark, N. J., Fourth Annual Show, New Jersey Automobile Exhibition Co.
Feb. 18-25	Albany, N. Y., Annual Show, Albany Automobile Association, State Armory.
Feb. 20-25	Cincinnati, O., Annual Show, Cincinnati Automobile Dealers' Association.
Feb. 20-25	Portland, Me., Sixth Annual Show, Auditorium.
Feb. 20-26	Omaha, Neb., Annual Show, Omaha Automobile Association.
Feb. 21-25	Baltimore, Md., Annual Show, Automobile Club of Maryland, Fifth Regiment Armory.
Feb. 22	Cleveland, O., Annual Show, Cleveland Automobile Show Company.
Feb. 24-27	New Orleans, La., Annual Show, New Orleans Automobile Club.
Feb. 25-Mar. 4	Toronto, Ont., Automobile Show, Ontario Motor League.
Feb. 25-Mar. 4	Kansas City, Mo., Fifth Annual Show, Kansas City Automobile Dealers' Association, Convention Hall.
Feb. 28-Mar. 4	Sioux City, Iowa, Second Annual Show, Sioux City Automobile Dealers' Association, Auditorium.
Mar. 4-11	Boston, Mechanics' Building, Ninth Annual Show, Licensed Automobile Dealers' Association.
Mar. 7-11	Des Moines, Ia., Third Annual Show, Des Moines Automobile Dealers' Association, Coliseum.
Mar. 14-18	Syracuse, N. Y., Third Annual Show, Syracuse Automobile Dealers' Association, State Armory.
Mar. 14-18	Denver, Col., Annual Automobile Show, Management Motor Field, Colorado Auditorium.
Mar. 15-18	Louisville, Ky., Annual Show, Louisville Automobile Dealers' Association, First Regiment Armory.
Mar. 18-25	Pittsburg, Annual Show, Pittsburg Auto Show Association (Inc.), Exposition Hall.
Mar. 25-Apr. 1	Buffalo, N. Y., Fourth Power Boat and Sportsmen's Show, Sixty-fifth Regiment Arsenal, Buffalo Launch Club.
Mar. 25-Apr. 8	Pittsburg, Fifth Annual Show, Duquesne Garden, First Week, Pleasure Cars; Second Week, Commercial Trucks. Automobile Dealers' Association of Pittsburg, Inc.
Apr. 1-8	Montreal, Can., Automobile and Motor Boat Show, Automobile and Aero Club of Canada.

THE AUTOMOBILE

Vol. XXIV Thurday, February 2, 1911 No. 5

THE CLASS JOURNAL COMPANY
H. M. SWETLAND, President
A. B. SWETLAND, General Manager
231-241 West 39th Street, New York City

EDITORIAL DEPARTMENT
THOS. J. FAY, Managing Editor
GEORGE M. SCHELL, Associate Editor
JAMES R. DOOLITTLE HUGH P. MacCONNELL
HANS WEYSZ

ADVERTISING DEPARTMENT
W. I. RALPH, 1035 Old South Bldg., Boston
C. H. GURNETT, F. W. VAN SICKLEN, 1200 Michigan Ave., Chicago
T. B. VAN ALSTYNE, New York and Phila.
H. L. SPOHN, New York
LOUIS R. SMITH, New York
FRANK B. BARNETT, 309 Park Building, Cleveland
H. H. GILL, 627 Ford Building, Detroit

Cable Address - - - - - - - - - - - - - - - - Autoland, New York
Long Distance Telephone - - - - - - - - - - 2046 Bryant, New York

SUBSCRIPTION RATES
United States and Mexico - - - - - - - - - - - - - - One Year, $3.00
Other Countries in Postal Union, including Canada - - - - One Year, 5.00
To Subscribers—Do not send money by ordinary mail. Remit by Draft, Post-Office or Express Money Order, or Register your letter.

FOREIGN SUBSCRIPTION AGENTS
ENGLAND:—W. H. Smith & Sons, Ltd., 186 Strand, London, W. C., and all bookstalls and agencies in Great Britain; also in Paris at 248 Rue de Rivoli.
FRANCE:—L. Baudry de Saunier, offices of "Omnia," 20 Rue Duret, Avenue de la Grande Armee, Paris.
GERMANY:—A. Seydel, Mohrenstrasse 9, Berlin.

Entered at New York, N. Y., as second-class matter.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (montaly), July, 1907.

FROM present indications, the 1911 trend of the automobile is along a line that is as much of a surprise to the insider as it can possibly be to any one. As the show season approached, a large percentage of the builders of automobiles were uncertain as to the outcome from the body point of view, and they debated the pros and cons of the torpedo type body, but when intending purchasers found it necessary to make a decision they did their part with promptness and dispatch, voicing the kind of sentiment that tells with the maker of cars when they said in substance: "Our preference is for fore-door types of bodies." A little later on when freight automobiles were shown at the Grand Central Palace, and later at Madison Square Garden, that part of the public which represents purchasing power gathered around these cars, and with a keen sense of the fitness of things, they made purchases at a surprising rate, and those who failed to act definitely at least made appointments for demonstrations, and, it is now well understood by the makers of freight automobiles that the market has taken on a definite turn, the character of which is so pronounced that the automobile art is confronted by a great emergency, and the makers of freight automobiles have yet to learn the ways and means by which they shall supply a pressing demand.

* * *

GLANCING over the list of items that confront automobile engineers who are struggling with the problems of standardization brings out the idea that so far as the motor is concerned it can never be standardized so long as the fuel used is an unknown quantity. If there is anything about the automobile business of which automobile engineers are not informed, it is gasoline. If there is any word that is abused to the utmost limit, it is this word "gasoline." In the ancient nomenclature of hydrocarbon fuels, the word "gasoline" applied to a definite distillate. In the modern process of the distillers of hydrocarbon products the word "gasoline" has been retained because it is just as good as any other word in the description of the liquid hydrocarbon that is used as fuel in gasoline motors. But the product available for this use is an absolutely unknown quantity in the haunts of the designers of motors, and it stands to reason that since a motor is designed and constructed for the purpose of interpreting fuel, with a view to utilizing the energy it contains, the quality of the motor—of the work it will perform—is primarily dependent upon the quality of the fuel employed.

* * *

FOR purposes of accuracy when motors are being tested and rated, it would seem to be as necessary to state the composition of the fuel utilized in the process as it is to count the number of cylinders, cyclic relations, method of cooling and to record the compression and other data. The reason why this fuel situation has not been the lever of a pressing necessity from the rating of motors point of view, is due to the rather close accord of the calorific of the several distillates available, and to the further fact that heretofore a considerable, if not predominating, measure of the so-called gasoline belonged in the more volatile fractions bordering upon hexane. The time has arrived when it can hardly be expected that automobiles will multiply, and that the demand for gasoline will be increased accordingly in the face of a possible diminishing supply, without bringing about a readjustment of the attending conditions. It would seem as if the first thing to do is to find out what is the composition of gasoline, and whether or not the present standard can be maintained, but if not, what the standard is to be, and then it will be possible for the designers of automobiles to design and rate motors in the light of established facts.

* * *

ELECTRICITY is coming into its own in the automobile business. True, it will have to live down the reputation that it has acquired during the years when trinkets and contraptions were foisted upon the industry by "bell-hangers," and automobilists everywhere will have to learn that the same electricity that is being used so successfully by them in the illumination of their places of business and residences, and in a thousand other ways too well known to require mention, is master of every situation to which it aspires, if it is properly placed and the handicap of ignorance is relegated according to its value. Electric lighting is now the vogue in automobile work, and this form of illumination is the same good and faithful servant that it has acquired a reputation for being in other fields, but the most marked activity electrically is in connection with vehicles, due to the better understanding of the battery situation, and to many important improvements that have been made by battery makers in recent times.

News Section

HAPPENINGS OF THE WEEK IN VARIOUS SECTIONS OF THE COUNTRY AS GATHERED BY THE 84 SPECIAL WRITERS AND CORRESPONDENTS OF "THE AUTOMOBILE"

Manufacturers' Contest Association Makes a Ruling on the Stock Car Definition—Troy Show Opens Its Doors to Big Crowds—Preparing for the Newark Show—The Recent Exhibition in the Quaker City Was a Huge Success—Brooklyn Show Will Be Attractively Staged—Thomas Neal Chosen President of General Motors—Independent Displays Form an Interesting Feature at the Big Show at Chicago—Preparing for Local Shows Throughout the Country—American Cars Are Gaining Ground in Australia—Short News of All Sorts.

M. C. A. Defines Term "Stock" Car for Contests

CHICAGO, Feb. 1—At a special meeting of the Manufacturers' Contest Association held in this city to-day many details of the rules governing stock cars for the coming season were gone over and amendments suggested and voted upon.

One of the leading features in the rules consisted in revamping the stock car definition so that it can be more readily understood by the promoters throughout the country.

The stock car definition in its new form is divided into ten or eleven numbered paragraphs, each paragraph dealing with one particular phase of the stock car. The general meaning of the definition has not been altered much.

For this season a stock model will be one that must be registered with Contest Board thirty days in advance of any contest in which the model is entered. According to the new rules it will be necessary for a member of the technical committee to visit the factory and check up the car parts with those on the car certificate.

This done, the car will be given a registration number by which number it will be known throughout the entire contest season. In defining the stock car, the fact has been made clearer that there must be twenty-five cars of the model built before they will be accepted as stock, or registered, or allowed to start.

In addition to this, the maker must during the year beginning July 1 and continuing to June 30 of the following season build a percentage of his total output of these models, the same as last year.

In order to properly cope with the commercial car situation a committee consisting of Walter White, James Joyce and Walter Wardrop was appointed to look into the commercial situation with a view of reporting back to the association at a future date. The general impression prevails that the commercial car tests up to the present have not done the truck industry much good other than by way of general publicity and that the rules have not brought out the most important problems of the truck industry.

It is the intention of the association to have a complete set of rules governing commercial tests framed and to favor not granting any sanctions for commercial tests until such rules have been formulated.

A supreme court for motordom was outlined at to-day's session when the members took up the matter of forming a reviewing board of the association which will be the court of last resort in contest matters. It was proposed that a fee of $1,000 be required of any contestant who desires to bring his protest to the jurisdiction of the board.

This sum would be forfeited to the board no matter what decision might be rendered finally. The association will remain in session over to-morrow and the complete findings will not be made public until some time later.

Banquet as Show Curtain-Raiser

CHICAGO, Jan. 28—The annual banquet of the Chicago Automobile Trade Association held last night at the Chicago Athletic Association, was, as usual, a curtain-raiser to the show in that it brought together the local tradesmen and some of the big exhibitors who took advantage of the occasion to review trade conditions and felicitate themselves on the prosperity that looms up ahead. The affair also marked the beginning of the end of the present administration, of which Louis Geyler is the head. The annual election which will take place shortly will see Mr. Geyler succeeded by N. H. Van Sicklen, Sr.

With Thomas J. Hay acting as toastmaster the evening was featured by the remarks of Hugh Chalmers, president of the Chalmers Motor Co., who addressed the meeting on salesmanship, the speech bristling with witty epigrams and toned throughout with optimism as to the future of the industry.

Other speakers included: Vice-President Schuyler of the Michigan Avenue Trust Bank, who talked on the relations between the bankers and the motor trade; S. A. Miles, general manager of the N. A. A. M., who explained the various angles of the different motoring organizations; David Beecroft, president of the Chicago Motor Club, who pointed out the growth of the industry, while F. L. Estep, of the Chicago *Examiner*, spoke on the relations existing between the press and the trade, and Everett C. Brown, president of the Amateur Athletic Union and former president of the Chicago Athletic Association.

Blanks for Canadian Reliability

WINNIPEG, Jan. 30—Entry blanks for the Canadian National Reliability Tour of 1911, promoted by *Modern Power* of this city, have been issued to the trade. The run starts August 1 from Winnipeg and circles northwest, touching Moose Jaw, Medicine Hat, Calgary, Edmonton, Saskatoon, Brandon and other places, being about 2,300 miles long. The rules that will govern are those of the Contest Board.

Entries close July 15. The cars will be classed according to the usual price divisions but the basis will be F. O. B. Winnipeg, rather than the manufacturers' list rates. The trophy is a bronze plaque of ornate design, with a number of subordinate prizes for those entrants whose scores most nearly approximate that of the winner.

Grossman Company to Move

NEW YORK, Jan. 30—The Emil Grossman Company will remove from 232 West Fifty-eighth street to the Motor Hall, 248-250 West 54th street, New York. It will occupy one-half of the fourth loft, 62 by 85 feet, with an automobile freight elevator.

First Troy Show Has Full Line of Fine Cars

TROY, N. Y., Jan. 30—The first automobile show conducted in Troy opened rather quietly this evening with a splendid line of automobiles on display in the State Armory. The attendance at the first session was small compared with the crowds that ordinarily visit the first night of other automobile shows, but it was of comfortable size and the various displays were most carefully inspected by the visitors.

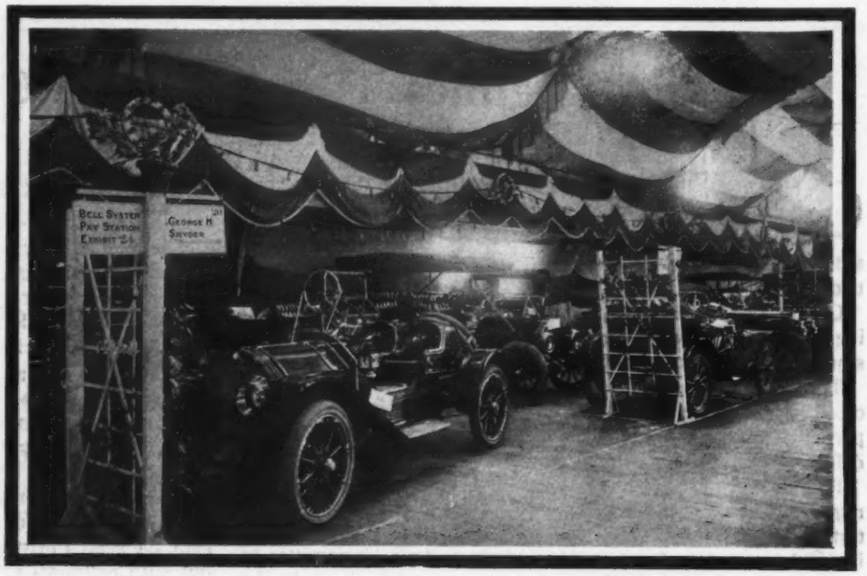
The show has been promoted by the Automobile Club of Troy, under the auspices of the Troy Military Companies. The drill floor of the building is 124 by 232 feet, giving a surface of nearly 30,000 square feet. Eighty-five models are shown, representing forty-four different makes and the widest sort of choice in the matter of power, type, body and price.

The Second Regiment Band has been engaged for the whole week and excellent musical programs have been arranged for each session. The plan of decorations is comprehensive and has been carried out with much care. The interior of the massive drill hall has been covered with thousands of yards of gold and white bunting and 3,000 colored incandescent lamps are so associated with the cloth decorations as to convert the hall into a most artistic setting for the automobiles.

Wicker columns are used to mark the lines between the various displays and these are surmounted with crowns of electric lights and wreathed in smilax. The decorative feature of the interior is a sunburst of lights arranged high on the South wall of the building and containing hundreds of electric bulbs. On each side of the sunburst there is a big five-pointed star, pricked out in lights. Along the balcony rail clear around the main hall there are electrical devices every 20 feet, while strings of lights depend from them and also others are artistically draped in numerous places throughout the building.

Strings of smilax and palms and plants have been placed liberally in the exhibition spaces.

Society night will take place Thursday and preparations have been made to entertain a large attendance. A special program, including several spectacular features will be given on that occasion and a military air will be imparted by a dress parade of the three Troy companies, under the direction of the brigadier-general commanding, which will be given during the evening.



Velie and Stevens-Duryea exhibits at the Troy Automobile Show

The show space is divided into thirty-four booths of ample size as follows:

Booth 1—Troy Insurance Co., Automobile and other kinds of insurance.

Booth 2—Rensselaer Automobile Exchange; two Moon touring cars and a chassis.

Booth 3—J. E. Falle; Brush runabout, one model.

Booth 4—Troy Automobile Exchange: Chalmers, five models; Pierce-Arrow, four models.

Booth 5—Albany Rubber Tire Co.: Selden, three models.

Booth 6—George W. Wait: Elmore, four models.

Booth 7—Oliver DuCharme: Pennsylvania and Auburn.

Booth 8—Scott D. Nichols: Ford, one chassis; three cars: Premier, one model.

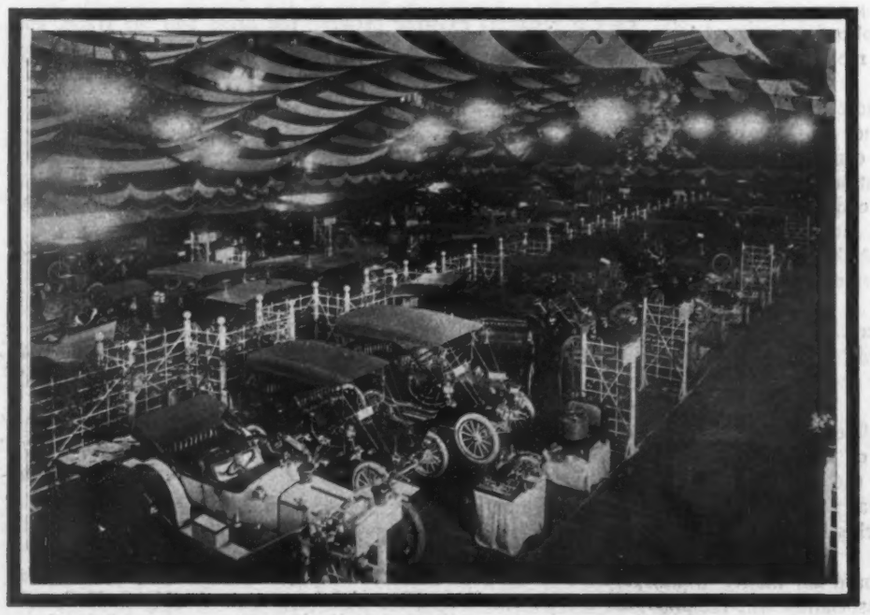
Booth 9—United Motor Albany Co.: Columbia, Maxwell and Sampson truck.

Booth 10—Tiona Oil Co.: Gasoline.

Booth 11-12—Automobile Club of Troy.

Booth 13—Commercial Union Telephone Co.: Wayside telephone systems.

Booth 14—Albany Motor Car Co.: Thomas, one model; Cadillac, chassis and three models.



General view of the first annual automobile show in the State Armory at Troy, N. Y.

Booth 15—Betts Auto Co.: Oldsmobile, two models; Middleby, Reading 40.

Booth 16—Bolton-Myers Auto and Truck Co.: Haynes and Parry.

Booth 17—Rayno, Bois and Reid: Marmon and Jackson.

Booth 18—Wilson Automobile Co.: Fiat, chassis and touring car; Pullman and Chase delivery truck.

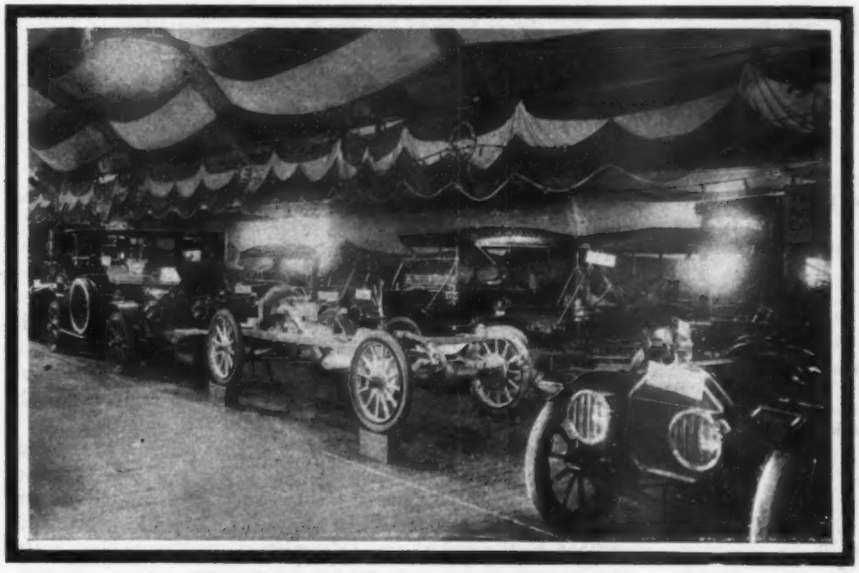
Booth 19—C. S. Ransom: Lozier, Hudson and Stevens-Duryea.

Booth 20—George H. Snyder: Velie, three cars.

Booth 21—Hudson Valley Auto Agency: Winton.

Booth 22—Albany Garage Co.: Simplex, Palmer and Singer and Peerless.

Booth 23—Troy Everitt 30 Co.: Everitt touring car, chassis and a complete set of parts, besides the Keen Self-Starter.



Pierce-Arrow and Chalmers Models in the exhibit of the Troy Automobile Exchange

Booth 24—New York Telephone Co.: Phone systems and service.

Booth 25—Fred V. Clute: Pope-Hartford.

Booth 26—J. A. P. Ketchum: Packard.

Booth 27—Trojan Garage: Locomobile, Stoddard-Dayton and Buick.

Booth 28—Payne Automobile Co.: E-M-F, Flanders and Studebaker-Garford.

Booth 29—Troy Motor Carriage Co.: Mitchell, Speedwell and Kelly truck.

Booth 30—C. H. Abbott: American, Stanley steamer.

Booth 31—Troy Motor Vehicle Co.: Cortland delivery.

Booth 32—The Wilbur Auto Sales Co.: Regal, Cole, Corbin and Kisselkar.

Booth 33—George H. Snyder: Stearns, chassis and three cars.

Booth 34—Burdick and Hartwell: Alco, National, Abbott-Detroit, Hupmobile, Alco truck.

A Curtiss aeroplane has been installed in the basement of the armory and Aviator Stevenson is scheduled to attempt a flight during the week, depending upon weather conditions.

The managers of the show are F. M. Baucus and F. N. Barhydt.

For Dakota Road Control

PIERRE, S. D., Jan. 30—The question of road improvement and good roads occupied the attention of the delegates to the conservation meeting here.

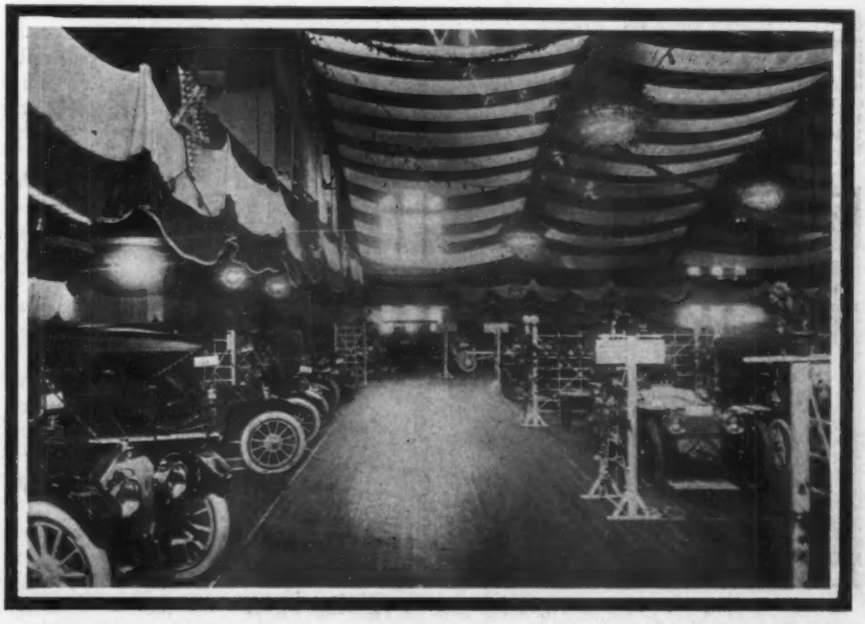
The discussion finally resulted in a vote of the convention indorsing a law which will leave the control of the roads in the hands of the civil township organizations unless they see fit by vote to surrender their rights to the county.

Fifty-two Exhibitors at Baltimore

BALTIMORE, MD., Jan. 30—Practically all arrangements are completed for the annual automobile show to be given at the Fifth Regiment Armory from February 21 to 25 under the auspices of the Automobile Club of Maryland and the dealers' association. Fifty-two exhibitors are scheduled to occupy space in the huge armory. Thirty-two of these are representatives of motor cars, while the other twenty are dealers in accessories and supplies, etc. As most of the automobile dealers handle two or more cars the various makes of autos to be represented at the show will be more than fifty.

The decorations will be uniform and will consist of more than fifty huge pillars, wound about with vines, which will be built up from the floor. On the top of each pillar will be the names of the respective motor cars, on a four-sided glass box with electric bulbs inside to show it off. The lettering will be in orange with a black background, the Automobile Club of Maryland's colors. The only individual decorations that will be permitted will be potted plants and cut flowers, in addition to the carpeting, which will be restricted to a green coloring.

As Washington's birthday will fall within the dates selected by the management, it is expected that the holiday will result in a largely increased attendance.



View along one of the aisles, showing the scheme of decoration at the Troy Show

Newark's Effort Will Rank High Among Local Shows

NEWARK, N. J., Jan. 30—With the First Regiment Armory taxed to its utmost to accommodate the exhibits, Newark's Fourth Annual Automobile show, during the week of February 18-25, will surpass in the number and variety of cars any show ever held in the State and will take rank with the big national exhibitions. With one or two exceptions, every standard make of pleasure car sold in the East, ranging in price from $400 to upwards of $6,000, is included in the list of exhibits that will be seen here. The complete list of exhibitors, with location of spaces, follows:

PLEASURE CARS

Space No.	Firm	Car.
1-6	J. W. Mason,	Maxwell, Columbia.
7-9	H. J. Koehler & Co.,	Hupmobile.
9A-10	Central Motor Car Co.,	Regal.
11-13	A. Elliott Ranney Co.,	Hudson.
14-15	J. J. Meyer,	Auburn.
16-18	N. J. Overland Co.,	Overland.
19-24	Ellis Motor Car Co.,	Pierce-Arrow.
25	Wm. W. Elder,	Abbott-Detroit.
26-27	The Woolston Co.,	Oakland.
28-30	J. M. Quinby & Co.,	Isotta-Fraschini, Simplex, S. G. V.
31-32	The Haynes Auto Co.,	Haynes.
33-34	Weldon & Bauer Co.,	National.
35-36	A. G. Spalding & Bro.,	Stevens-Duryea.
37-40	Peerless Motor Car Co.,	Peerless.
41-44	Paddock-Zusi Co.,	Chalmers.
45-47	Rickey Machine Co.,	Marmon.
48-50	Linkroum Auto Co.,	Winton.
51-54	Greene Motor Car Co.,	Locomobile.
55-58	Detroit Cadillac Co.,	Cadillac.
59-61	R. M. Owen Co.,	Reo, Premier.
62-63	The Oldsmobile Co. of N. Y.,	Oldsmobile.
63A	O'Neil Motor Car Co.,	Paterson.
64	A. J. Hague, Jr.,	Inter-State.
65-67	Waring Motor Car Co.,	Marion.
68-72	F. L. C. Martin Auto Co.,	Alco, Mitchell.
73-74	N. J. Automobile Co.,	Moline.
75-76	Hiram L. Fink,	Elmore, Mercer.
77	E. R. Thomas Motor Co.,	Thomas.
78-79	Lee Automobile Co.,	De Tamble.
80-81	Fiat Auto Co.,	Fiat.
82-83	Correja Motor Car Co.,	Correja.
84-85	Lozier Motor Car Co.,	Lozier.
86-90	Buick Motor Co.,	Buick.
108-109	West Side Garage,	Moon.
110-111	Wallace-De Wilde,	Cole.
112-113	Alexander Brunner,	Kline Kar.
114	Reynolds & Erwin,	Penn.
115-116	E. D. Carlough,	Franklin.
117-118	Studebaker Bros. & Co.,	Studebaker, E-M-F and Flanders.
119-121	Stoddard Motor Car Co.,	Stoddard-Dayton.
122-125	Packard Motor Car Co.,	Packard.
126-127	B. F. Adams & Co.,	Bergdoll.
128	Electrical Maintenance & Repair Co.,	Detroit Electric.

COMMERCIAL CARS

90A-92	F. L. C. Martin Co.,	Alco, Rapid.
93	Veerac Sales Co.,	Veerac.
94-95	Atterbury Motor Car Co.,	Atterbury.
96	R. M. Owen Co.,	Reo.
97	Peerless Motor Car Co.,	Peerless.
98	Packard Motor Car Co.,	Packard.
99-100	W. G. Dunham & Son,	Auto Bodies.
101-102	Commercial Main. & Motor Co.,	Grabowski.
103-104A	Crescent Auto Co.,	Mack.
105-107	Autocar Company,	Autocar.

Showing a Studebaker automobile fitted with an American "Ever Ready" automatic engine starter, which works by pressure on a pedal, the latter being located at a convenient point on the footboard of the car

ACCESSORIES

1-2	W. S. Sheppard, Oils.
3-4	N. Y. Auto Top and Supply Co., Supplies.
5	Norben Oil Co., Oils.
6	Western Mfg. Co., Shock Absorbers.
7	Col-Mac Co., Carbureters.
8	Hardman Tire & Rubber Co., Tires.
9	C. E. Garrabrant, Pyrene.
10-11	Standard Oil Co., Oils.
12	Charles J. Byrne, Vulcanizers.
13	N. J. Motor Equipment Co., Supplies.
14	P. C. W. Mfg. Co., Tire Tools.
15	Wilcox Auto Co., Tire Rims.
16	Meteor Gas Tank Co., Tanks, Oils and Greases.
17-18	Newark Glass Co.
19-20	G. O. Graves & Co., Bodies.
21-22	N. J. Auto Top Mfg. Co., Auto Tops.
23	Essex Storage Battery & Rep. Co., Batteries.
24	L. Lawrence & Co., Bodies.
25	Meyers Brothers, Supplies.
26	Economy Auto Supply Co., Supplies.
27	National Oil & Supply Co., Oils.

Quaker Show a Great Success

PHILADELPHIA, Jan. 30—After two weeks of uninterrupted success, during which time the highest hopes of the most optimistic were exceeded, Philadelphia's Tenth Annual Automobile Show, the first attempted solely of cars licensed under the Selden patent, under the auspices of the Philadelphia Licensed Automobile Dealers' Association, came to a successful end Saturday. While the average daily attendance during the second week, devoted to motor trucks, delivery wagons and electrics, fell slightly below that of the first week, it was all that could be desired, and the interest manifested has naturally been a source of profit.

Then, too, it should be remembered that visitors to the final week's display were not merely of the pleasure-seeking class, being composed in the main of men who attended for the purpose of having demonstrated to them just why it would be to the advantage of themselves and to the houses and firms they represent to permanently supplant the horse-drawn method of transporting their wares by the motor-propelled vehicle to meet the increasing demands being made on their delivery systems. And never, in this city at least, have the manifold advantages of the truck been more forcibly demonstrated as regards general economy, facility of transportation, relative speed and reliability.

And what is true of the truck section of the show holds equally as well as far as the electric feature was concerned. The ease of operation, grace and general degree of cleanliness of this machine have especially commended it as an ideal town car. Its appeal is irresistible to those living a considerable distance from the shopping district of the city, where the ordinary means of transportation at best are inconvenient and a source of no little loss of time.

In connection with the motor vehicle show this week local city and fire department officials were treated to the sight of an automobile fire engine in action on Friday. The test was held preparatory to the acceptance by the city of this style of fire-fighter, which, if the committee of local officials witnessing the demonstration agree was a satisfactory one, will eventually supersede the horse-drawn apparatus and its attendant difficulties. An appropriation looking toward that end has already been provided by Councils, which will probably be applied to the outlying sections, they being the first to benefit. The demonstrating engine used was the product of the Knox Company.

All told, the truck department of the show comprised seventeen different makes and ranged from the light wagon for the delivery of small parcels to mammoth vehicles capable of transporting the most cumbersome and burdensome load.

The insufficient capacity of the armories is the only discordant note in the aftermath of the show, and it is to be hoped that all the talk of a convention hall of large dimensions, which has hitherto vaporized into thin air, will take on a more substantial form before another year rolls around.

Salmon Pink and White Brooklyn Show Colors

BROOKLYN, Jan. 30—Judging from present indications the Brooklyn Automobile Show, which is to be held in the Twenty-third Regiment Armory from February 18 to 25, under the auspices of the Brooklyn Motor Vehicle Dealers' Association, will be one of the greatest motor car exhibitions held by dealers in this country.

Already forty-seven different makes of cars are scheduled for exhibition. A number of accessory dealers have secured space and everything in the way of fittings will be displayed. The big armory will be filled to overflowing with everything that is new and interesting in the motor world.

At a largely attended meeting of the association, last week, at which were present Manager Charles H. Green, Master Decorator M. A. Singer and the chairmen of the various committees who are carrying out the details of the show, it was learned that $50,000 is being expended for the decorating of the big armory.

The colors that will predominate throughout the scheme are salmon pink and white. Uniformity in the signs of the exhibitors, furniture and decorations will be carried out. The exhibition spaces are to be covered with a green carpet and the walls are to be hidden by a soft green fabric. The big girders of the building will be entirely hidden by a canopy.

The work of decorating the armory interior will begin the latter part of this week and it is promised that everything will be in readiness when the doors are thrown open to the public.

Joseph D. Rourk, chairman of the entertainment committee, reported at the meeting that his committee has secured Caroline B. Nichols and the famous Fadette Women's Orchestra, of Boston.

It was decided at the meeting that the show be open to the public from 1 o'clock p. m. until 11 o'clock p. m., with the exception of the first night of opening, when the doors will be thrown open at 7:30 p. m. There will be a matinée price of twenty-five cents charge each afternoon during the week with the exception of Tuesday, February 21, which is to be known as "Society Day," when there will be a charge of one dollar for the entire day and night. The price of admission in the evenings, excepting Tuesday evening, will be fifty cents.

The committees represented at the meeting and their respective chairmen were as follows: Exhibition, C. F. Batt; reception, E. T. Bloxham; finance, H. L. Carpenter; entertainment, J. D. Rourk; press, W. H. A. Bruns; transportation, A. W. Blanchard.

Space a Problem at Washington

WASHINGTON, D. C., Jan. 30—Plans for the show to be given by the Washington dealers during the week of February 13 are rapidly maturing. The show committee has the project well in hand and the indications are the annual exhibition will be the largest and best in the history of the local trade. It is whispered about in trade circles that President Taft will again honor the show by his presence. It will be remembered that last year President Taft, who is an ardent motorist, dropped into the show late in the afternoon and spent some time inspecting the various cars. He was so pleased with his visit that it is thought probable he will repeat it this year.

Every inch of space has been taken in the show and there are a number of prospective exhibitors clamoring for room in which to show their goods. How to meet the demand is one of the problems confronting the show committee.

The following cars will be exhibited: Brush, Reo, Woods, Cole, Lion, Schacht, Stoddard-Dayton, Stoddard, Rambler, McIntyre, Moline, Haynes, Ford, Velie, R-O, Overland, Oldsmobile, E-M-F, Flanders, Studebaker, Maxwell, Columbia, Pierce-Arrow, Cadillac, Baker, Packard, Hupmobile, Chalmers, Stevens-Duryea, Peerless, Matheson, Pope-Hartford, Oakland, Moon, G. J. G., Regal, Apperson, Detroit, Buick, Welch, Paige-Detroit, White, Rauch & Lang, Pullman, Bergdoll, Warren-Detroit, Marion, Locomobile, Interstate, Columbus, Washington, and Thomas.

Overflow Show at Worcester

WORCESTER, MASS., Feb. 1—The demand for space at the Automobile Show to be held in the Auditorium Feb. 7 to 11, under the auspices of the Worcester Licensed Automobile Dealers' Association, has been so large that the Franklin garage, one of the largest in the city, situated near the main show building has been secured for an overflow show space for 73 exhibits; the capacity of the auditorium has all been contracted for, while but little remains to be disposed of for the overflow.

Many special features have been arranged for, including the Martha Washington coupé which attracted attention at the New York show. Society night and Club night, for which all auto clubs in Worcester county will be invited, will be featured.

C. W. Campbell, architect and designer of the Boston Auto show, will have charge of laying out plans and decorations of the show, which will be the first affair of the kind in Worcester on any such elaborate scale.

Both Pittsburg Shows Prosper

PITTSBURG, Jan. 30—The two Pittsburg shows are getting along nicely. The Exposition Automobile Show has secured a number of attractions including five aeroplane manufacturers. A recent meeting of the Exposition Automobile Show Society was held at the Hotel Schénley with thirty members present.

The Duquesne Garden Show has secured the services of the Pittsburg Symphony Orchestra as a big musical feature. The entire seating including boxes and chairs will be covered by a platfrom, thus increasing the floor space about 5 000 square feet.

Grand Rapids Has Show Fever

GRAND RAPIDS, MICH., Jan. 30—What bids fair to be one of the large automobile shows of the country this year and one which will rival all collections of automobiles of various makes and models and designs ever drawn together under one roof in Western Michigan or perhaps the entire State will be the display of the Grand Rapids Automobile show to take place Feb. 15 and continue three days.

It is estimated that there will be $300,000 worth of 1911 models on exhibition. The Auto Dealers' Association is the formal sponsor for the big enterprise, but the show will be conducted under the auspices of the Grand Rapids *Herald*. A. H. Vandenberg is chairman of the show committee and C. L. Merriman is manager.

Joseph Borovitz, Chief Engineer of the Adams Brothers Company, Findlay, O.

Thomas Neal Chosen President of General Motors

DETROIT, Jan. 30—Thomas Neal, for years the head of the Acme Qualities Company, of Detroit, and one of the best known manufacturers of this city, has been chosen by the board of directors of the General Motors Company to be the president of that concern. Mr. Neal's acceptance of the position is announced. The salary, it is stated on good authority, has been placed at $50,000.

The meeting of the board of directors at which Mr. Neal's election took place also resulted in a full choice of officers as follows:

President, Thomas Neal, Detroit; vice-president, E. O. Wood, Flint; secretary, Standish Backus, Detroit; treasurer, James T. Shaw, Detroit; controller, C. A. Magee, Detroit.

Mr. Neal was selected, it is understood, because of his record as a manufacturer and a systematizer. He has not been identified with the motor car manufacturing industry heretofore, the Acme Qualities being a maker of paint. It is understood that he will retain his connection with the Acme Qualities, though he has systematized the work of that enterprise to an extent which will allow him to devote all his energies at present to the reorganization of the General Motors.

Mr. Wood was formerly the assistant to W. C. Durant when the latter was the guiding spirit of the General Motors corporation. He will reside in Flint and will work in close touch with the main office of the corporation, which will soon be established in Detroit.

Mr. Backus is a young Detroit attorney who has had charge of the legal affairs of General Motors for some time.

Mr. Shaw has been for some years identified with J. S. Lapham & Company and is a well-known Detroit business man. It is said that a total of $60,000,000 a year will pass through his hands as treasurer. Little is known locally of Mr. Magee, who came here recently from St. Louis.

Until further announcement and perhaps permanently the headquarters of General Motors will be located in the upper floors of the Buick salesroom on Woodward avenue. Whether or not other arrangements will be made later is a matter of doubt. At present, both Mr. Shaw and Mr. Magee have offices there.

Vice-president Wood returned Saturday from a visit to New York, where he went to inquire into the slump which has recently affected General Motors securities. He announced here that, in his opinion, the stock was being affected by a bear movement, inaugurated by parties desiring to secure control of the properties. Mr. Wood believes that the situation will speedily be remedied and predicts a bright future for the newly reorganized properties. Nearly all the 20 and more properties of General Motors are now running, particular activity being in evidence at the Cadillac, Buick and Oldsmobile plants.

Secretary Murphy, speaking on behalf of W. C. Durant, authorized the following statement with regard to the absence of the name of Mr. Durant from the list of officers:

"W. C. Durant is first vice-president of General Motors and is a member of the board of directors and finance committee of that organization and is actively identified with the management. Mr. Wood's mission in New York was to sign the permanent certificates which will replace the temporary certificates of indebtedness, the basis of the recent $15,000,000 flotation. In reality Mr. Wood is not a director of General Motors."

W. J. Mead is also a hold-over vice-president.

Quakers Give Annual Dinner

PHILADELPHIA, Jan. 30—Unanimity of opinion regarding the abolition of toll gates, the building and maintenance of good roads, the good work being done by the Quaker City Motor Club in that direction and the Fairmount Park Road Race characterized the remarks of the speakers at the third annual banquet of the Quaker City Motor Club held in the Hotel Walton last week. About 150 members, guests and representatives of the press attended and the consensus of opinion was that it was the most successful yet held and that the cause of good roads and a State highway in Pennsylvania from Philadelphia to Pittsburg was given a substantial boost.

The Quaker City Motor Club was hailed as a pioneer in road-building and was eulogized for its indefatigable work in season and out of season in this movement, and for the admirable way in which the club has conducted the annual road race in Fairmount Park. The assembly room in the Hotel Walton was beautifully decorated for the occasion with flowers and ferns and an orchestra completely hidden by banks of ferns dispensed music throughout the evening.

Joseph P. Rogers, one of the leading lights of the local bar, filled the post of toastmaster and wittily introduced the various speakers of the evening.

Charles Thaddeus Terry; Webster Grim, late candidate for Governor of Pennsylvania; S. M. Butler, who announced that in future a grand circuit of automobile racing would be established —along lines similar to that under which horse racing is conducted each year—and that the Fairmount Park race would form a feature of this circuit; John Weaver, ex-Mayor of Philadelphia; Nathan T. Folwell, president of the Manufacturers' Club; Henry F. Walton, Prothonotary of Philadelphia, and J. R. C. McAllister, head of the finance branch of the city government, all exploited the virtue of the automobile and the building of good roads.

PLANT WHERE THE NEW ALDEN SAMPSON CAR IS BEING MANUFACTURED AT DETROIT.

Private Displays Feature of Chicago Show Season

CHICAGO, Jan. 30—One of the features of the Chicago show season is the number of outside exhibits of automobiles. Over a score of different makes of automobiles are being displayed in various places in the city. Among these private displays are the following:

Ford: By the Ford Motor Co.'s Chicago Branch, 1444 Michigan avenue.

Palmer & Singer: By the Chicago agency in the Auditorium lobby.

Warren-Detroit: La Salle Hotel.

Paige-Detroit: La Salle Hotel.

Ideal Electric: La Salle Hotel.

Cunningham: La Salle Hotel.

McFarlan Six: Charles A. Coey, 1426 Michigan avenue.

Mais Truck: Charles A. Coey, 1426 Michigan avenue.

Abbott-Detroit: Centaur Motor Co., 1725 Michigan avenue.

Henry: Henry Motor Car Sales Co., 1507 Michigan avenue.

Cutting: Chicago Coach and Carriage Co., 1223 Michigan avenue.

Oakland: 2019 Michigan avenue.

Empire: 2025 Michigan avenue.

Grout: Garfield Park Auto Co., 1407 Michigan avenue.

Haynes Six: 1346 Michigan avenue.

Paterson: 1420 Michigan avenue.

Imperial: 1407 Michigan avenue.

Whiting: 1420 Michigan avenue.

Velie: Velie Motor Car Co., 1615 Michigan avenue.

Regal: Regal Motor Car Co., 1460 Michigan avenue.

Personal Angles of Chicago Show

CHICAGO, Feb. 1—There is a goodly representation of the United States Motors allied companies at the various exhibits in the Coliseum and Armory.

President Benjamin Briscoe came in Wednesday together with Horace Delisser. Frank Briscoe and Sales Manager Harris are in from Detroit. H. W. Nuckols and F. E. Dayton are to be found at the Columbia booth. Sales Manager Jamieson and Gridley and Addams from the Stoddard-Dayton are here. Others of the United States Motor family who are busy in their various capacities are Advertising Manager Monty Hallowell, L. A. Van-Patten of the Alden Sampson, Berry Rockwell of the Maxwell, James Evans of the Brush and L. E. Latta of the Maxwell.

C. C. Winningham is at the Hudson stand. H. E. Coffin is booked for a meeting here. Designer Fred Toome, of the American of Indianapolis, is taking an active part in making converts for his original designs.

M. H. Cormack came on from the Brooklyn factory to look after the welfare of the newly launched Atlas chains.

Fred Keating is in charge of the Dorian rim booth. With him is Fred Simone, one of the Dorian experts, who is changing both tire and rim under trial conditions in a minute with the Dorian Q. D. equipment.

C. A. Emise, of the Lozier Co., is around the Lozier exhibit.

Guy Hutchinson is heralding Corbin merits.

Lee F. Counselman and Harry Ford are prominently arrayed with Chalmers cohorts.

Hugh Chalmers is at the Blackstone.

H. M. Leland and K. P. Drysdale, of the Cadillac, are prominent figures.

J. E. Pratt, Vernon Law and William Lavin are representing the Pierce factory from Buffalo.

Frank Joyce came to aid the forces with the Chicago Alco crowd.

J. D. Murphy is looking after Selden interests.

Advertising Manager Bryant, of the Franklin Co., will be away from the Salt City for both weeks of the Chicago show.

C. H. Warner, of the Warner instrument company, is enjoying the situation.

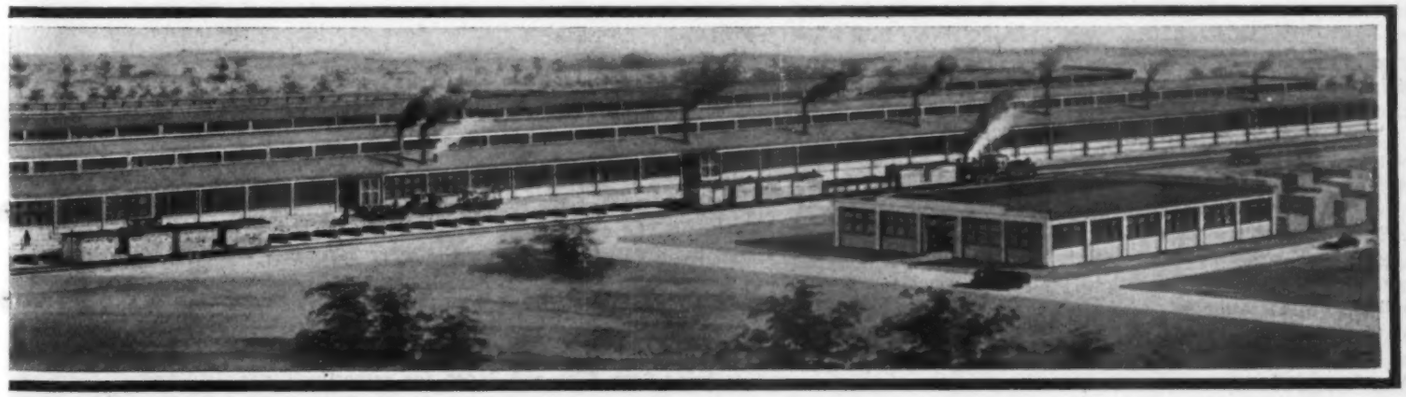
Moving Sampson Plant to Detroit

DETROIT, Jan. 30—Formal announcement of the large plans of the Alden Sampson Manufacturing Company have created a stir in local manufacturing circles. This firm is now operating a large factory just north of the city in Hamtramck. Up to to-day it also operated a large factory at Pittsfield, N. J. The machinery of the Pittsfield plant is now on the way to Detroit. When it arrives and is installed Detroit will be in possession of another very large motor truck factory.

The decision to abandon the Pittsfield plant and concentrate all the energies of the Alden Sampson Company in Detroit was recently made. The details have been arranged by Morris Grabowsky, of this city, the vice-president of the company.

To-day, when the assigned work at Pittsfield has been completed, the loading of two special trains was begun, motor trucks being employed for much of the transportation between the factory and the siding. It is estimated that the work of transporting the machinery and other equipment will consume in the neighborhood of two weeks. The trains will be left on the Alden Sampson Company's Detroit siding and work will begin immediately installing the machinery.

The Pittsfield factory has been manufacturing the company's road train, and the four and five-ton trucks. The Pittsfield factory has been in operation since 1904. The Detroit factory is a development of the past year, since the absorption of the Alden Sampson Company.



MICH. THE FIRST CAR PUT OUT IS BEING SHOWN AT THE CHICAGO COLISEUM

American Cars in the Australian Field

(By a Special Correspondent)

SYDNEY, N. S. W., Jan. 2—Australia, like other civilized countries of the world, is making good progress with motors and to-day the number of cars registered throughout the Commonwealth is nearly 10,000, made up as follows in the five different States: New South Wales, 2,500; Victoria, 2,600; South Australia, 2000; West Australia, 950; Tasmania, 800.

In addition to this number there are about two hundred taxicabs and other vehicles plying for the public hire. Looking back as recently as two years ago, there were only about a third of this number of cars and these were chiefly used in the cities, the country farmer having then a poor opinion of the utility of the motor; but to-day he is fast recognizing the value of the automobile, and motor cars are to be seen in every district.

A gold boom recently sprang into existence in West Australia and the usual rush for claims immediately followed. It startled the ears of many when they heard that the first to reach the field used motor cars and thus secured the best blocks.

The Knight-engined Daimler has taken on wonderfully well since its introduction less than eighteen months ago, which is a following of its great boom in England. All the leading British cars are placed on the Australian market, but in most instances their sale is inferior to that of the Continental cars, despite the preference of tariff in favor of the British car. New garages are going up very rapidly in numbers and they are being built and equipped in a modern style and in some instances they almost equal European garages.

One of the most striking features of the Australian trade is the rapid growth of sale of American cars. Less than two years ago the only American cars to be seen were a few Fords, Reos and several cheap cars of the air-cooled and friction gear type in New South Wales and several Oldsmobiles in the other cities. Although the Fords and Reos gave their owners good service, the American cars were termed "Yankee rubbish," principally owing to the fact that the previous importations of American cars were of the cheapest class made and the agents cared little or nothing for the cars after they once sold them. But to-day the situation is completely changed, and in Sydney alone there are hundreds of American cars to be seen running through the streets, comprising chiefly Fords, Cadillacs, Reos, Buicks, Brushes, Hupmobiles, while the latest introduction to these shores are, viz.: The Thomas, Cole "30," Maxwell, Overland, Chalmers-Detroit, E. M. F. and Moline.

Practically every agent in Australia is now including an American agency in his 1911 program, and such cars as the Packard, Peerless, Studebaker and Stoddard-Dayton are to be introduced, and their advent is being eagerly waited by every one who uses a motor car, and when these cars are on the roads the Australian motorist will find that American cars are a better proposition than he first thought them to be, especially when they are tested on the rough country roads. It is on the country roads where many a good European car fails, owing to the low ground clearance, weak springs and axles, and also the excessive weight of European cars in proportion to the power of the engine causes them to be useless in sandy and muddy country.

Having experience in America with bad roads, the American manufacturer is looked upon as the most likely to fill the bill for cars to suit Australian requirements.

In addition to the makes of cars mentioned above, the K. R. I. T., Mitchell, Marion, Parry and Paige-Detroit have all found agents in Australia. Each agent is guaranteeing a fair number of orders, and the prospect of the future seems that agents will have to force the sale of American cars in order to get rid of their consignments. Most of these agencies have been placed by a house of manufacturer's agents who deal principally in American products.

Taking into consideration that every agent in Australia has several British and Continental agencies to look after, it is hardly probable that he will be easily induced to accept another line of American cars, so that makers who are not already represented will have to look for new companies starting business or they will have to induce the present agents to drop a European line in favor of their cars.

Now, as a matter of fact, the European manufacturer is getting alarmed at the American invasion, and at the present A. W. Roslington, of the Belsize Motor Company, Manchester, England, is traveling throughout Australia and New Zealand renewing contracts with his agents, while the Dennis, Berliet, Standard, Delaunay-Belleville and a few others have also sent out representatives to secure their contracts. In each of these instances sample cars accompanied the representative. Some five years ago it will be remembered that the Reo and Rambler both had sent representatives to Australia. The business which resulted, as far as the Reo is concerned, was very good, considering the great prejudice they had to contend against, and it may be necessary again for manufacturers to send out representatives with cars for the establishing of pushing agents.

Manufacturers who desire to have a market should bear in mind that large cars are quite unsalable in Australia, as the wealth of the people is not so great as it is in England and America, or, in other words, inherited fortunes and chances of being millionaires are very few indeed. The average ambitious Australian has a good, steady income, which permits him to own a moderate sized car, and any car over 25 horsepower and weighing more than 25 hundredweight will stand a poor chance of business in the future.

As tires have to face a tariff of 25 per cent. and the cost of transport from Europe in addition, the Australian motorist considers the tire bill before anything else, so that light cars ranging from 15 horsepower to 25 horsepower will command the best part of the market.

The firm of Roy W. Sandford, of Sydney, who handled the Cadillac with success, now selling the Chalmers, imported two big cars recently and found it no easy task to sell them on account of their size.

The small, light runabout, which can be sold here from £150 ($750) to £350 ($1,750), and more particularly those having four cylinders and magneto ignition, is going to have a good sale here, and many an owner of a large, expensive car will speculate in a cheap and neat runabout just for the fun of having it, and another demand is coming from commercial travelers, etc., as our railways, etc., are very inconvenient for business men.

French Grand Prize Race for 1911

A very wise step has been taken by the Automobile Club of the Sarthe in announcing that the motor car race for the Grand Prix de France will be held on Sunday, June 25, whatever the number of entries. It must be admitted that the race has not been received with a great deal of enthusiasm by French manufacturers, and as a doubt existed as to whether the race would ever be held or not, a big entry list was not expected. All doubt having been removed, manufacturers who have up to now adopted a waiting attitude may be expected to send in their entries. As will doubtless be remembered, the race is open to four-cylinder cars having a maximum bore and stroke of 110 mm. by 200 mm. It has since been decided that six and eight-cylinder cars shall be admitted providing their total cylinder area is not greater than that allowed for the four-cylinder models, and that the ratio of stroke to bore is the same. Entries for the Grand Prix de France will be received by the Automobile Club of the Sarthe until April 1, the fees being $500, $800 and $1,000 for respectively one, two and three cars from the same factory. If a profit is made on the race the half of this amount will be divided among the starters.

Peeps Through Auto Goggles at Distant Lands

BIRMINGHAM, England, has a chemist who has invented a process for transforming gasoline or petrol into a white, stiff jelly, by means of which he claims to effect a saving of 30 per cent. in the material used. The process includes the addition of alcohol and 1 3-4 per cent. of steatite, the latter being a mineral ordinarily used in the manufacture of porcelain ware, the composition of crayons and in the polishing of marble—in other words, soapstone. A high-powered automobile is said to have made several long and successful trips in England by using the jelly in place of the gasoline in its natural form.

His Highness, the Nizam of Hyderabad, India, has proclaimed himself an automobile enthusiast. In addition to a large number of machines which he has possessed for quite a length of time, some of his cars being American-made, the Nizam has just acquired a six-cylinder Napier, of 4-feet-8-inch gauge, with a wheelbase of 15 feet and 9 inches. The machine has an enclosed aluminum tonneau. The price paid for this car was 45,000 rupees, or $14,599. His Highness is one of the most progressive of the East India potentates, and he was not only one of the first to take up the custom of automobiling, but he is among the most enthusiastic devotees to the sportsmanship of automobiling.

The value of automobiles imported into Burma during the fiscal year ending March 31, 1910 (the latest report published), was $69,583. Great Britain's contribution to this trade amounted to $65,236. The United States is not represented in a single car. The Belsize and Rover 10 to 15-horsepower cars are the most popular after considering the English machines used in Ragoon A few of the French Renault cars are also in commission. The popular gauge is from 4 feet to 4 feet 6 inches. Large cars are not popular except in almost the immediate vicinity of the city. The demand for small size commercial vans and vehicle-motor trucks is growing. The English Halley car is just being introduced. Gasoline costs fourteen cents per gallon. It is worthy of knowing that well-to-do natives of India, the rich Burmese, civil servants, army officers, professional men, people in various lines of business, bankers, shop-keepers and even clerks have their own horses, carriages and automobiles. Nearly everybody uses these conveyances, for the reason that there are no tram-car lines leading to the outlying districts, which extend from three to ten miles from the business center. The price for a little Burma pony and a one-horse, two-wheeled dogcart or buggy, is from $500 to $600; while a pony and four-wheeler cost from $700 to $1,200. This would buy quite a respectable small automobile, and there would be no extra expense for oats. There would seem to be a splendid opportunity for American-made automobiles in Rangoon. The Burma railways buy motor vans for the delivery of parcels direct from the manufacturers. The Bibby or Henderson Line, by way of Liverpool, or by the Hamburg and Hansa Line are reliable and expeditious routes over which shipments of automobiles can be made.

The great and rapidly increasing plantation para rubber industry in the Malay Peninsula is having the effect of creating a demand for automobiles, both of the touring and commercial types. There are now 425 automobiles in Singapore, compared with less than 200 at the beginning of 1910. There are 2,000 miles of splendid metal roads through the Federated Malay States and the Straits Settlements, and in these sections the increase in the number of automobiles is proportionate with Singapore. The fact that the Government is also alive to the modern vehicle is shown in the activity of the railway officials who have established a fine automobile or motor-car service in connection with the railway lines for the accommodation of the traveling public. The para rubber planters in all parts of the country are expressing their gratitude over the fact that the introduction of the pleasure and the business automobile has made life worth the living.

That the wealthy Chinese are waking to the modern idea of the use of the automobile as a vehicle of business and pleasure is evident from the interest that the dozen or more machines in Tientsin have created. Nine of these machines are the property of foreign residents, the remaining number belonging to native Chinese. The Tientsin streets where the foreigners reside are in fine condition for motoring, the roadbeds broad and level and excellently macadamized. A splendid boulevard encircles the native city, occupying the site of the ancient moat and city wall. Peking also has twelve automobiles for use on her wide, fine streets. Peking obtains her foreign-made goods through Tientsin, which is eighty-nine miles distant by rail. The one bar to a great trade in automobiles in China at the present time is the narrowness of the average streets and the dearth of respectable roads. Many of the latter are merely winding tracks for carts. The main vehicle seen outside of the cities is the heavy wooden two-wheeled cart drawn by horses and donkeys. Rain has the effect of beating the roads into quagmires. The water rushing over the hillsides cuts out great gulleys. Nevertheless, the automobile would be a success if introduced to a greater degree even for the use of ladies. The prevailing custom of ladies is to ride in carriages or sedan chairs with the blinds closed. For this reason the automobile might appeal to the feminine portion of the Chinese nation. Roads are improving gradually. Gasoline is worth thirty cents a gallon, a very moderate price.

The manager of a Mannheim firm of automobile dealers is now in the United States to look over the field of low-priced American cars. The concern which he represents was organized in 1904 with a capital of $467,000. During the past year the firm's business amounted to nearly $800,000, and a dividend of 10 per cent. was declared. There seems to be a growing demand in Germany for a cheaper car than is produced in that country. It was the intention of the Mannheim firm to manufacture a small car with the view to trying it on the market, but its members came to the conclusion that they would give the American small cars a trial first. The necessity as observed in the majority of foreign countries of having the parts in stock for the immediate replacement of broken parts obtains also in Germany. It is almost impossible to find repair-parts in cases where the American firm has no representative in the German cities. A good stock of parts for repairs is a profitable stock in reserve. The demand for smaller cars all over Germany seems to be quite general.

To Give Chicago-New York Truck Run

CHICAGO, Jan. 30—The Chicago Motor Club is undertaking the promotion of the most strenuous reliability run for commercial motor vehicles that ever has been attempted in this country—a trip from Chicago to New York in which an effort will be made not only to demonstrate the road efficiency of both trucks and light delivery wagons but also to show conclusively the cost of operation. As yet the plans are in an embryonic state but within a week or so the technical committee of the club will compile the rules that will govern what might be called the national commercial motor vehicle test. The contest committee of the Chicago Motor Club settled upon this big event at its meeting Thursday, when it outlined its plans for the coming season. It was settled that the truck run should be held in July, probably the latter part of the month when the roads are the best, and that the affair should be spread over 10 days with the business machines being called upon to run at least 100 miles a day. The pace will be easy, approximately 10 miles an hour.

In addition to the truck contest, the club also announced four other big events, all of them repetitions of contests held during 1910.

Cost of Overlooking the Jack

HOW THE METHODICAL AND SEVERE AUTOMOBILIST STANDS IN HIS OWN LIGHT EVERY MINUTE

FIRST cost of an automobile is really unimportant if the purchaser makes a good selection, in other words if he buys a car that will serve for his purpose and continues to do so on a reasonable cost of upkeep, so that the depreciation in the long run may be looked upon as 10 or 12 per cent. It is in the cost of maintenance that the average purchaser is overtaken by his own poor management. In the maintenance of an automobile, the main considerations may be briefly stated as follows:

(a) cost of tires;
(b) cost of gasoline;
(c) cost of lubricating oil;
(d) cost of refinishing;
(e) cost of periodical overhauling;

It is a great misfortune perhaps that these subdivisions of cost of maintenance are all so inter-related that while it seems simple enough to state them separately, this freedom from complication entirely disappears with discussion. The cost of overhauling a car, for instance, will be more or less, depending upon the divisions (a), (b), (c), and (d); just which of these factors will have the most marked effect upon periodical overhauling depends upon attending circumstances, it being the case that a large amount of damage can be done in a few hours by stinting the lubricating oil supply, and a considerable portion of the cost of overhauling will attend the use of too much gasoline. or if the owner is quite careless about washing and cleaning the car after its use each day, the finishing item will resound to his disadvantage, and then, there are the legitimate overhauling problems as taking up wear of the bearings, and adjusting the parts with respect to each other, grinding in valves, timing, and quite a few other details of this general character, which, if not looked after in a timely way, will break out of bounds and become formidable.

Tire cost, all things considered, is the most serious and pressing item that confronts the average automobilist, and from all that has been said upon this subject from time to time automobilists might gather the impression that this cost is inevitable, and that it is their lot to grin and bear. Granting that a little intelligence must be displayed by those who wish to evade an undue cost of tires, this is not to say that automobiling must of necessity be attended by unreasonable tire bills, although these costs have tricky ways, and it not infrequently happens that the methodical and severe automobilist is the one who suffers unduly.

If it may be taken for granted that the discussion here is limited to the questions of tire cost on that class of automobiles which is equipped with tires sufficiently large to carry the load according to present accepted practice, it remains to observe that if the tires are carefully adjusted on the wheels, and are suitably lubricated by means of talcum or other tire lubricants, they must then be inflated up to the desired limit of pressure, size considered, and they must be kept in this inflated condition every minute that the cars are in motion. A set of tires that might run several thousand miles without showing undue depreciation will give out perhaps within a mile, at all events within a very short distance, if the air is allowed to seep out of them and undue flexure of the tire fabric is thereby brought about.

The average careful automobilist probably understands this situation quite perfectly and yet actual measurements of tire pressures in cars in practice almost invariably show that the pressures are not maintained at the proper level and the tires are unduly flexed nearly all of the time. But even this abuse of tires is to be set down as secondary in comparison with the tires that are permitted to run flat, simply because the owner is either too indifferent to his own good, or he fails to appreciate the fact that an automobile is too heavy to lift, and that a jack is necessary to raise the car while he works upon the tires.

In listening to the reminiscences of old time and experienced automobilists, not a few of them take keen delight in relating how they substituted fence-rails, cobble-stone and stray property picked up by the roadside, improvising a jack in the process, but they generally overlook the fact that they ran the tire flat for a mile or two along the road while looking for the materials out of which to improvise the jack. The tire. under such conditions, is bruised and otherwise damaged until it is almost a waste of time to try to utilize it in further service, and stating the result briefly it is only necessary to say that a $50 tire is cut to pieces while the unconscious automobilist goes in quest of a loose board on a farmer's fence to take the place of the jack that he failed to provide in the tool-kit.

Granting that the tool-kit should include a jack, the fact remains that automobilists either utilize their cars in pleasure pursuits or for business purposes, and it stands to reason that there is no pleasure in straining the muscles until they are sore, and ruining a tailor-made suit of clothing while fumbling around with a decrepit and worn-out jack, nor can it be good business to subordinate the main idea to a puttering process which all comes about if a business man starts out in his car and the same is improperly equipped with the tools and facilities that will permit him to repair his tires quickly and efficaciously if the occasion requires so that he can go about his business with but small delay. The jacks afforded by the market include a considerable variety among which will be mentioned the Raiswell jack as shown in Fig. 1 which is made by the Lovell-McConnell Mfg. Co., of Newark, N. J. This jack, as the illustration shows, works on the principle of the screw in combination with a differential gearset, and a bevel gearset, actuated by means of an extension shaft with a bit-and-brace handle not unlike the equipment used by carpenters in the boring of holes.

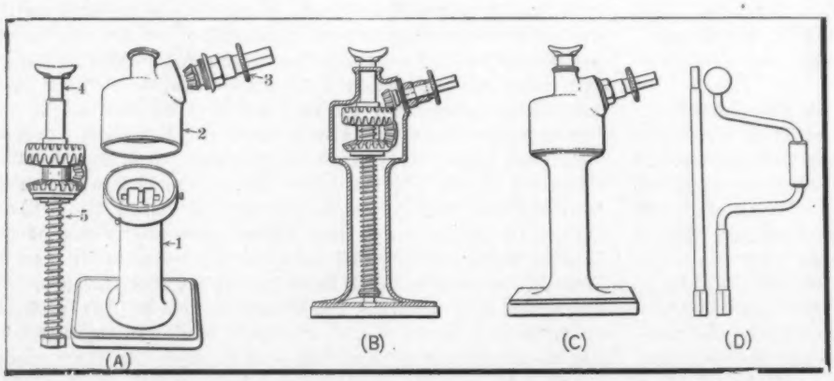


Fig. 1—Four views of the "Raiswell" Jack, (A) showing the screw, differential set, bevel pinion, housing and stand; (B) A ghost view of the jack assembled, showing the relation of the mechanisms; (C) Looking at the completed jack, showing symmetry, strength and compactness; (D) Showing the crank and extension shaft, by means of which the automobilist is permitted to stand upright alongside of the car, and by turning on the crank lift the car off the ground with but small effort. The equipment occupies but little space in a suitably contrived case, which may be stored in the tool-kit or elsewhere

The multiplying of the pressure put upon the brace by the operator is first through the bevel gearset, and this effort in turn is sustained by the differential gear, through which the effort is transmitted to the screw on the end of which the lifting pad is placed.

Among other well-known similar devices now on the market are the following:

Springfield—The Springfield Jack as shown in Fig. 2 is made in several sizes, the one depicted being No. 0, with a lifting capacity of 1,000 pounds. The height of the jack is 11 inches and the screw is capable of lifting 6 inches. The handle for operating is conveniently carried in a socket at the side of the device with a thumb screw to hold it in position when the jack is not being used. The total weight is 3 1-2 pounds. This jack is manufactured by The Shawver Company, Springfield, Ohio.

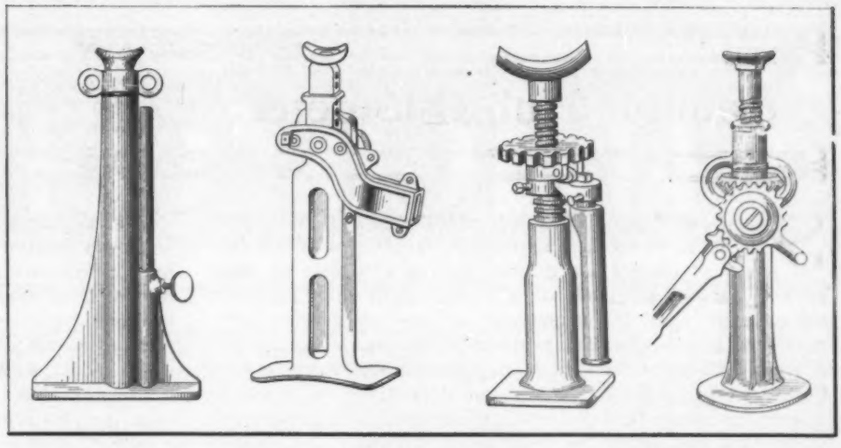


Fig. 2—Showing the Springfield, Peerless, Empire and Ideal Jacks

New Peerless—This jack is operated on the rack-and-pawl principle by means of a lever that can also be used for a tire tool. The top forms a hollow swivel which will catch under a bolt or circular part without the danger of slipping. It is possible to operate the jack at any angle and without reaching under the car. Working the handle below the level raises the lift; to lower, turn the handle over or work it above the level. The jack is made in three sizes for cars varying in height from 8 1-2 to 12 inches. The jack weighs about 4 pounds, and is manufactured by the Oliver Machine & Mfg. Company, 18-20 Stetson street, Orange, N. J.

Empire—This jack is guaranteed to lift 6,000 pounds, weighing itself but 5 pounds. When closed it stands 9 inches high and extends to 19 inches when fully opened. The right and left-hand movement governs the rise and fall and the two lifting screws work within the other in opposite directions. It is made by the Empire Jack Co., 11-15 Dill street, Auburn, N. Y.

Ideal—This jack is operated on the pawl-and-pinion principle in connection with a bevel wheel and interior screw. The handle is permanently attached and the top forms a swivel. When folded it is compact and handy. The Ideal is manufactured by the Elite Mfg. Co., Ashland, Ohio.

Crown—The principle on which this jack operates embraces a ratchet pinion, cam and rack. On the interior of the pinion out of sight is a worm cam which engages with the rack on the lifting slide. When the rack is rotated the worm raises or lowers the slide. There are two spring knobs that permit the pinion to be swung out of mesh and the slide to be raised to the required height, the latter being situated behind the base and the former above the pinion. No. 1, here depicted, weighs 5 1-2 pounds, has a lifting capacity of 2,000 pounds and an adjustment of 10 1-2 to 18 inches. The Crown jack is manufactured by the Ashland Manufacturing Co., Ashland, Ohio.

Hartford—This jack is well designed to do the work asked of it. The jack proper is fitted to a wooden base, as also a wooden handle of sufficient size to give a good leverage. It operates on the rack-and-pinion principle with enclosed gears. To reverse the direction of movement there is a small turnover catch marked "up" and "down," and the only thing to do to lower the car after it has been raised is to move this catch over and work the lever in the same manner as for lifting. It is manufactured by the Hartford Suspension Co., 140 Bay street, Jersey City, with several branches in other cities.

Pratt—These jacks are made of malleable iron, and galvanized to prevent rusting. As an example of their simplicity there are only five parts, which are held together by two bolts. The construction, as will be seen from the illustration, consists of a rack and double pawl.

Buckeye—This jack belongs to the rack-and-pawl type and has a specially long tire iron handle, avoiding the necessity of crawling under the car to operate it. These jacks are made in a large variety of sizes, with different size lifts and different weights. They are manufactured by the Buckeye Jack Mfg. Co., Alliance, O.

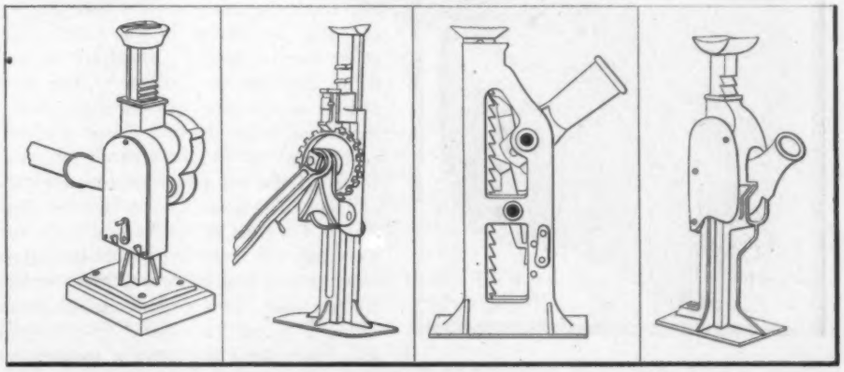


Fig. 3—Showing the Hartford, Crown, Pratt and Buckeye Jacks

Hess-Bright Issues New Catalogue

Conspicuous among catalogues for 1911 is the new Hess-Bright catalogue of H-B (D. W. F.) ball bearings. The catalogue is 9 1-4 x 12 inches, with an embossed brown board cover, beautifully engraved and embellished, treating on the various phases of the manufacture and use of annular-type ball bearings, not only in automobile work, but for the many other purposes to which these bearings are being put, including bearings for dynamo-electric machines, shafting and drives, blowers and fans, turrets for guns, turntables, and a wide variety of industrial equipment. The physical properties of materials used in ball bearings are discussed in a learned way, and the limits of tolerance in the application of bearings are discussed. A chart on page 10 gives curves of the coefficient of friction in per cent., load for different specific loads, and a tabulation on page 11 affords information bearing upon the relation of loading to speed involving the question of lubrication. Some of the applications of these ball bearings to transmission gears and automobile motors are shown, and the testing equipment employed in the Hess-Bright plant is fittingly illustrated. In addition to tabulations of the sizes and ratings of Hess-Bright ball bearings, there is a wealth of information which should be of great service to the automobile engineer.

Reliable Hub Odometer

DESCRIPTION OF THE VEEDER DEVICE FOR MEASURING SPEED AND DISTANCE TRAVELED, WITH INSTRUCTIONS FOR ATTACHING IT

SPEED and distance-recording instruments for automobiles, not so long ago mere aids to the satisfaction of the curiosity of owners and drivers, have now become an indispensible part of the outfit of a well-equipped car. Especially since the advent of the commercial car have speed and mileage recorders become a vital necessity. In this connection the Veeder Hub Odometer, made by the Veeder Manufacturing Company, of Hartford, Conn., is one of the latest examples. It is made by using a hub cap of the same style as the ones on the automobile, but about one inch longer. This added inch of room is used to make a chamber for holding the mechanism required. This chamber is partitioned off from the rest of the hub by a strong plate which is thoroughly secured.

The indicator is a Veeder odometer that is fastened to the end of the hub cap, and is visible through a rectangular hole. The edges of this hole are beveled so that the figures may be always plainly seen, even though the end of the hub-cap is thick and strong. A bevel gear on the shaft of the instrument works with another bevel gear that is driven by a ratchet and pawl. The pawl is operated by an eccentric which makes a revolution every time the wheel to which the hub-cap is fastened revolves. It makes no difference whether the wheel is turned backward or forward, the action of the pawl is the same in either case and hence every revolution of the wheel is recorded. The shaft to which the eccentric is fastened passes through the partition plate in the hub-cap and a stuffing-box is provided to keep oil or grease from working out of the hub into the odometer chamber. The end of the eccentric shaft which is in the hub carries an eight-tooth gear which engages another gear of the same size that is fastened to the axle of the automobile. As the axle of the automobile does not turn, the gear on the eccentric shaft runs around it, so that the eccentric makes one revolution for each revolution of the wheel of the automobile. The gear that is fastened to the axle is provided with a shank on one side. This shank enters a hole which must be drilled in the end of the axle and the cotter-pin (split-pin) which keeps the nut from coming off, passes through a hole in the shank and thoroughly secures the gear from turning.

The hub-cap is a solid casting having no openings except the small one which is filled by the indicator and the larger threaded opening which screws onto the hub. Consequently, if the hub-cap is sealed after it has been screwed on, there is no way for any one to interfere with it unless they smash it or break the seal. The method of sealing is very simple. A pair of lugs or ears projects from one side of the hub-cap at its inner end. A hole is tapped through the cap between these lugs and there is a small hole in each lug. After the hub-cap is in place on the wheel, a sharp pointed set-screw is inserted in the tapped hole and screwed down into the hub. This set-screw also has a small hole in its head, and a seal-wire is passed through the holes in the lugs and the hole in the screw between them. The two ends of this wire are then sealed together by a lead seal similar to that used in sealing the doors of freight cars. As the hub-cap cannot be taken off without loosening the set-screw and as the set-screw cannot be loosened without breaking the seal-wire, the odometer is absolutely sealed.

The mileage indicator is cemented into the hub-cap and the inside partition is properly packed so that the hub-cap odometer is water tight.

In attaching this device, it is first necessary to drill a 5-16 inch diameter hole in the center of the axle, then insert the shank of the driving gear. Drill a hole through this shank in line with the cotter-pin hole already in the axle, just large enough to take the cotter-pin, and put the cotter-pin in place. Screw the hub-cap odometer onto the hub, and then screw the locking set-screw down so that it sticks into the hub, after which insert the seal-wire and seal.

In addition to the hub odometer this company makes odometers which are attached to the dash, some with one indicator and the more elaborate having two dials—measuring trip and total mileage. The tachometer combines the principles of the odometer with a speed indicator, and is operated by a liquid centrifugal system run at a speed corresponding with that of the car.

Fig. 3—Showing method of attaching to the hub.

Fig. 1—Front view of the Veeder hub odometer

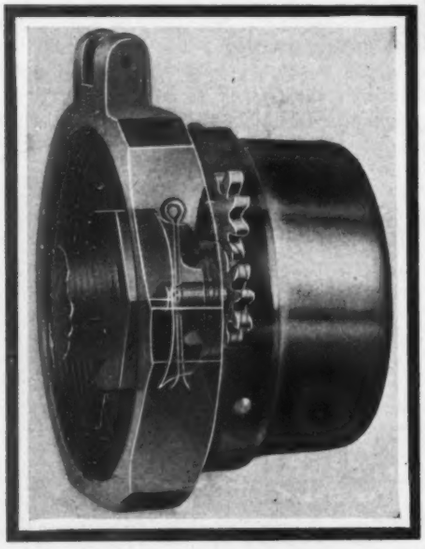


Fig. 2—Showing method of fixing pinion to end of driving shaft